T-KIT Catalog No.
A2000

T-KIT

A Division of TEN-TEC, Inc.

Manufacturer of AMERICA'S BEST
Amateur Radio Transceivers

NEW! Model 1254
100 kHz - 30 MHz
Receiver, page 3

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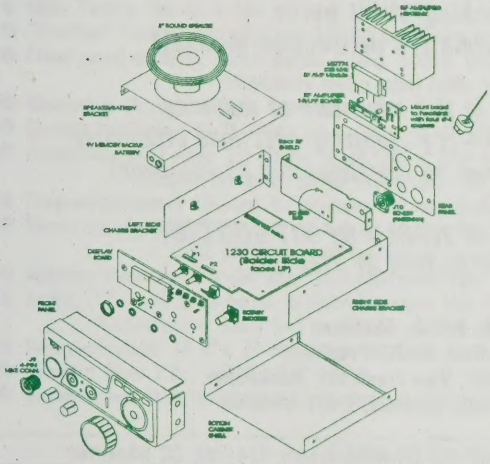
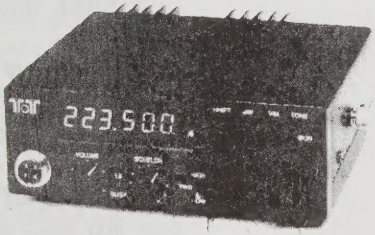
T-KIT by TEN-TEC

Today's proven standard in ham radio kit building.





T-KIT

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While the ham/electronics world has been lamenting the grand old days of kit-building, the TEN-TEC team of hams, engineers and technicians has been working to bring those days back to you!

TEN-TEC is the RIGHT company to bring you the very best in electronic kit-building using today's top technologies. We have 30 years of experience with the rapid changes in ham radio, and we stand today as the primary USA manufacturer of amateur transceivers . . . from the world-class Omni-VI Plus to the affordability of our take-anywhere "Scout." We manufacture enclosures, hardware, and even transformers in our own plant and we have a legendary reputation for customer support. In fact, we're the only major transceiver manufacturer which encourages you to open up your rig and fix problems yourself with our friendly help.

We've watched the kit industry with interest since our beginning. In fact, when he was president of Electro-Voice™, our chairman, Al Kahn, lent a hand and a big load of parts to some Michigan pals starting up a post-War company they named Heathkit™.

The 100 people in the TEN-TEC manufacturing plant promise you these three things absolutely ***essential*** *to any electronics kit product:*

1. **Quality engineering design**
2. **Careful packing of kit parts**
3. **Clear, informative instruction manuals**

Become our partner in this adventure of restoring the USA kit-building tradition — by following directions attentively, using that ever-proud American craftsmanship as you build!

WELCOME TO A NEW WORLD OF KIT-BUILDING
from just some of us here at TEN-TEC . . .

AL KAHN, K4FW, Chairman
Jack Burchfield, K4JU, President
Tom Salvetti, KC3NF, Vice-President, Marketing
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Larry Boyd, WB4ZXQ, Analog/RF Engineering
Boyd Lichlyter, KE4MCF, Analog/RF Engineering
Hardy Shelton, KA4RHX, Analog/RF Enginering
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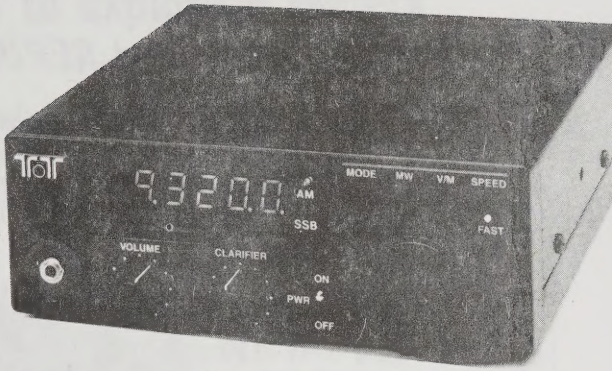
Stan Brock, WDØBGS, Customer Service
Raymond Henry, AA4LL, Customer Service

TEN-TEC
. . . America's Best!

Enjoy TEN-TEC Receiver Quality with Digital Tuning for Worldwide AM-SSB-CW, from 100 kHz to 30 MHz!



T-KIT Shortwave Receiver Model 1254: only $195 and the smoothest kit-building experience you can imagine!

The grand tradition of receiver kit building is no longer confined to direct-conversion or regenerative designs! The Model 1254 combines the satisfaction of a serious kit building experience with the performance features expected in a modern HF receiver at a very competitive price. You will build a true dual-conversion superhet with a microprocessor-controlled frequency synthesizer. Building this receiver yourself gives you the assurance that you can maintain it in perfect working order.

BUILDING SKILL LEVEL: Intermediate ● **BUILDING TIME:** 20 to 25 hours

- **Frequency coverage:** 100 kHz to 30 MHz ● **Modes:** AM, SSB/CW
- **Main Tuning:** Normal or Fast tuning (2.5 kHz SSB, 5.0 kHz AM, or 100 kHz steps for either mode)
- **"Clarifier" Control:** for ±1.5 kHz SSB/CW fine tuning between 2.5 kHz steps.
- **Front panel controls:** On/off switch, Tuning, Volume, Clarifier, Mode Select, Memory Write (MW), VFO/Memory tuning select (V/M), Tuning Rate Select (SPEED)
- **Memories:** 15 programmable memories
- **Circuit:** Synthesized 45-75 MHz local oscillator ● 45 MHz first I-F, 455 kHz second I-F
- **Sensitivity:** AM mode: 2.5 μV for 10 dB SNR at 30% modulation
  SSB/CW mode: 0.5 μV for 10 dB SNR ● **Selectivity:** 4 kHz @ -6 dB
- **Frequency/Memory Display:** 6-digit green LED with mode indicators
- **Power supply:** 12-15 VDC, 250 mA current consumption with no signal present;
  15VDC @800 mA wall transformer supply *included* with kit.
- **Antenna connector:** 50 ohm input, RCA-style phono jack
- **Audio:** 1.5 watts audio output to internal speaker, plus 1/8" stereo phone jack for standard personal headphones or direct feed to 4-8 ohm external speaker, data interface or both.
- **Semiconductors:** 10 IC's, 26 transistors, 16 diodes
- **Compact Size:** 2.25" x 6.5" x 6.5" (HWD)
- **Construction:** Steel clamshell case, aluminum chassis, custom-molded front panel.

EASY ALIGNMENT!

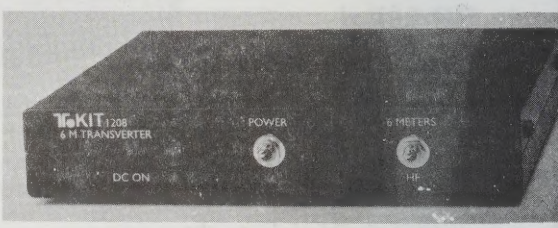
Yesteryear's serious superhet receivers involved many dozens of alignment points, usually requiring professional service equipment, often scaring away the casual hobbyist. To "align" your state-of-the-art Model 1254, you need only a VOM and your ear! During kit construction, we provide **Progress Tests** for each of the 6 Assembly Phases. The receiver generates its own built-in 45 MHz test signal.

T-KIT Model 1254 Shortwave Receiver KIT: $195.00
(Includes all parts, DC power supply, Kit Manual, SWL Guide and Log booklet)

Let's Get Together and REPOSSESS 6 Meters!

How long can FOUR WHOLE MEGAHERTZ of precious semi-HF VHF spectrum just sit there for us hams if so few of us have gear to even try out this fascinating 6 Meter band? The T-KIT 1208 Transverter lets new Technicians and oldtimers alike repossess 6 Meters at a VERY nice price!

SSB-CW-FM **6-Meter Transverter**



Add the excitement of the 50 MHz amateur band so easily to ANY modern ham transceiver, including all those 20-Meter-only QRP rigs. A transverter lets you transmit as well as receive on 6 Meters, using the precision digital tuning, available modes, memories and other features of your HF transceiver. It's simple: 14.000 MHz on your display or dial is 50.000 MHz. To operate SSB on 50.200 MHz, simply switch the 1208 to 6 Meters, tune to 14.200, keep transceiver RF output under 5 watts, and just go for it! The 8 Watts RF output is generous power during good band openings and for local communications and repeaters.

Features:

- ❑ Use with any transceiver capable of 3-5 watts on 20 meters
- ❑ Extremely simple hookup and operation
- ❑ Low-noise 50-54 MHz receiving input
- ❑ Easy front-panel switching between HF and 6M antennas
- ❑ Fast, silent RF-sensing PIN diode T-R switching for QSK and data communication

Specifications and Operating Requirements: 12-15VDC at 3.0 amperes external DC power requirement • RF output at 51 MHz: 8 watts typical • standard 20M transceiver required for basic 50.000-50.350 MHz Beacon/CW/SSB operation • FM operation requires FM transmit/receive capability of a general coverage transceiver capable of 14-16 MHz operation, with repeater offsets being a function of the transceiver's VFO memory system • Receive 50-54 MHz; transmit 50-52 MHz (transmitting above 52 MHz is not recommended) • the 14 MHz transceiver RF output MUST be attenuated to 5 watts or less.

T-KIT No. 1208, Six-Meter Transverter Kit, $95.00
No. 1208A, Assembled/Tested 6M Transverter, $159.00

JUST WANT TO LISTEN IN . . .

on 6 Meters on a budget? Try a fine little 6-Meter Receive Converter with any 10 Meter receiver or transceiver by building T-KIT Module Board No. 1061 for only $17.00. 28-30 MHz receiver coverage tunes 50-52 MHz. SEE **Page 14.**

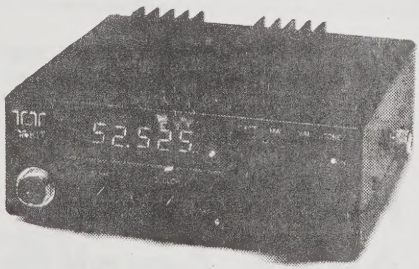
More Ways to explore 6 Meters

T-KIT Model 1209 Transverter: 8 watts RF output on 6 meters from your 2 meter rig or HT for only $95!

Newly-licensed hams: explore your operating privileges beyond 2 Meters VERY economically! Operate 50-54 MHz on any mode covered by your 144-148 MHz rig or HT. With the same general features and specifications as our popular 1208 6 Meter Transverter (see page 4), the Model 1209 was designed for those regions where 6M FM repeaters take the load off the busy 2M systems. And you may find yourself making cross-country simplex QSO's during those exciting 6M band openings.

Just think: only $290 gives you BOTH 2M and 6M if you build and use the 1220 Transceiver and 1209 Transverter! (See page 10)

T-Kit Model No. 1209 6 meter Transverter KIT, $95.00
Model 1209A, factory assembled, $159.00



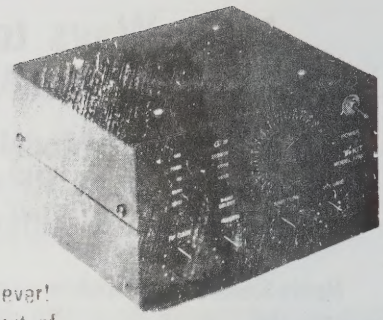
T-KIT Model 1260 6 Meter FM TRANSCEIVER for only $195!

- **15 programmable memories**
- **ready for 6M's varying transmit offset schemes**
- **microprocessor-controlled**
- **complete with microphone, internal speaker and mobile bracket**

Read about the Model 1220 2M transceiver (pages 10-11) and imagine the same great-looking rig ready for easy and fun 6M FM repeater or simplex action, no matter what kind of transmit offset scheme is employed! FCC regulations currently prohibit the sale of an add-on amplifier, but our many happy transverter owners can tell you that a few watts on 6M is a blast!

T-KIT Model 1260 5 Watt 6 meter Transceiver KIT, $195.00.

9-Band Shortwave Receiver



The classic "first radio kit" is back better than ever! We've combined the very same audio output circuit of TEN-TEC transceivers with a modern FET design for classic regenerative SWL receiving plus one button electronic bandswitching. The result is an easy-to-build shortwave radio that's fun and interesting for the whole family. No alignment required. Simply install all parts as directed, put together the high-quality mechanical parts, and start enjoying the magic of shortwave radio. Explore 9 smooth-tuning SWL and ham bands from 1.8 to 22 MHz at the push of a ⏏ button! Receives AM, SSB, CW and all those other magical shortwave sounds.

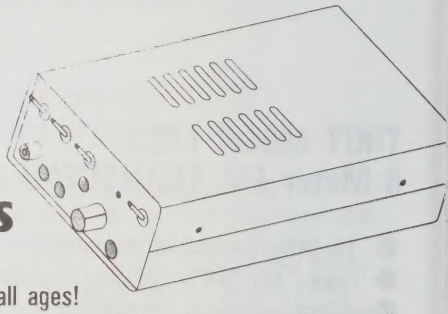
FEATURES: Front-panel RF gain, Volume, Regeneration, Tuning **and Fine-Tuning** controls ● generous audio from Signetics TDA2611A to built-in speaker or stereo phone jack ● Electronic switching of 9 tuning ranges ● rugged, rounded clamshell steel enclosure ● simple, clear linear logging scale for large tuning knob ● requires 8 alkaline C cells or external 12VDC.

KIT No. 1253, $59.00

On a tight budget with a club of eager radio builders? Our 4-Band Model 1054 Module Board Kit has comparable features for only $24! See page 14.

Listen to the Mysterious Sounds of ENERGY!

Hi-Sensitivity Audio Amplifier with Experiments



A wonderful project kit for experimenters of all ages!

Build a rugged, versatile, portable utility amplifier (for which you'll find dozens of practical uses over the years). Then, begin to explore the fascinating world of the unique sounds made by all kinds of energy — from lightning whistlers on the other side of the world to the stress noise of a bending paperclip. Listen to radar, to light waves, to your computer. Listen to nearby radio signals on any frequency, any mode. In addition to the kit assembly manual, you get a fascinating project booklet based on experiments by USAF Engineer Calvin R. Graf as your guide to adventures with the sounds of Energy. Amp;ifier features hi and low Z inputs, switchable preamp, 1.5W output. Requires 8 "AA" batteries or external 12-15 VDC.

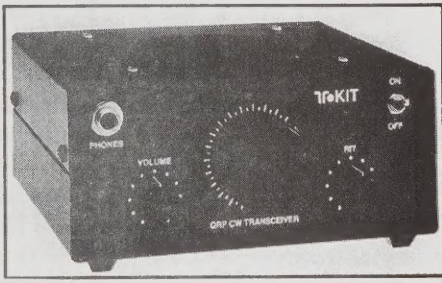
NOTE: The kit includes accessories for many of the energy listening experiments. You will need 1x2" wood (furring strips) and wire to build the 4' loop antenna explained in the project booklet.

T-KIT No. 1252, $44.00

Take your favorite CW band anywhere for only $95!

TEN-TEC began in 1968 with the release of very inexpensive "QRP" transceivers. We thought it would be fun to revisit those roots. We explored **today's** RF technology and components to see just how inexpensive, compact and simple a ***quality*** QRP kit rig could be. The low price and great receiver design make these QSK VFO-controlled transceivers a smart choice for those times and moods when you want to try out a few watts of RF output. Get on the air from the beach, or a mountaintop, or your office or dorm room!

A New Family of QRP CW Transceivers!



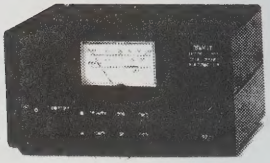
T-KIT Model 1320 for **20 Meters**, $95.00
T-KIT Model 1330 for **30 Meters**, $95.00
T-KIT Model 1340 for **40 Meters**, $95.00
T-KIT Model 1380 for **80 Meters**, $95.00

Frequency Coverage: VFO tuning of any 50 KHz segment of CW subband. Tuning range is selected during winding of one toroid in the VFO circuit.
Frequency Control: varactor tuned oscillator with potentiometer control. Temperature compensated LC components stabilize VFO.
RIT (receive incremental tuning): ±1.5 KHz.
Antenna: 50 ohm unbalanced, SO-239 connector.
Power requirement: 12-14VDC, 35 mA. receive (no signal), 80 mA receive (S-9 signal), 800 mA on transmit.
Construction: Black texture painted clamshell-type steel top and bottom, aluminum chassis, subpanel and heatsink. One 3.5"X5" double-sided circuit board.
Board-mounted Components: 216 including 4 IC's, 19 transistors, 13 diodes.
Front Panel Controls: main tuning, RIT, volume, DC on-off toggle.
Connectors: front panel 1/4" stereo phone jack; rear panel SO-239 for antenna, 3 RCA jacks for key, DC input, accessory DC output.
Dimensions: HWD 2.75"x6"x6". **Weight:** 2.25 lbs./1.02 kg.

TRANSMITTER:
- **RF Output:** 3 watts typical, no external adjustment ● **T/R Switching:** solid state, full break-in
- **CW offset and sidetone:** Adjustable 400-1000 Hz sidetone automatically tracks offset frequency. Sinewave sidetone has internal level adjustment.

RECEIVER:
- **Type:** single conversion superhet, JFET mixer ● **Sensitivity:** .25 μV typical for 10 dB S/N
- **Selectivity:** 4-pole crystal ladder filter (1 KHz nominal bandwidth)
- **AGC:** audio derived ● **IF frequency:** 11 MHz on 80 and 40 meter models; 14.32 MHz on 30 meter model; 6.14 MHz on 20 meter model.
- **Audio:** 300 mW @ 4 ohms, built-in 3" speaker

20/200 Watt **SWR Bridge & RF Wattmeter** for BOTH 1.8-30 MHz AND 144-148 MHz!



Build this top-quality station accessory that you'll use for a long, long time. Features easy-to-read meter, front panel switching of 20 or 200 watt ranges, HF or 2-Meters, sensitivity control, four SO-239 antenna and transmitter connectors, all housed in a rugged steel enclosure less likely to bounce at the mercy of RG-8 coax! Range: 1.8 to 30 MHz *plus* 2 Meters! Separate HF and VHF connectors let you leave the unit in-line with BOTH rigs. Convenient toggle switching between HF and VHF. This is your USE-ANYWHERE RF Power/SWR meter system!

T-KIT Model 1202 SWR Bridge Kit, $49.00

No. 1202A, wired and tested, $74.00

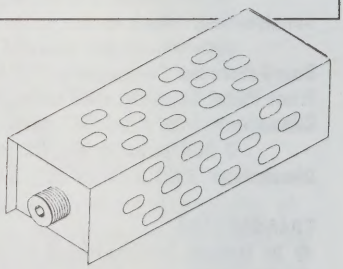
TEN-TEC . . . *America's Best!*

You have the common sense to know why TEN-TEC doesn't build into the cost of our radios the cost of giving away hats 'n stuff at hamfests. But, we're proud of the many requests we get for TEN-TEC caps, mugs, or other symbols of the made-in-USA pride that you share with the 100 folks at TEN-TEC. So, if you'd like our sharp-looking, top-quality *embroidered* all-weather cap (gray, with black/red design), it's yours for a few % over our cost! Thanks for joining the TEN-TEC team!

TEN-TEC embroidered cap, adjustable band, $10.00.

RF Dummy Load

50-Ohm, 300 Watts



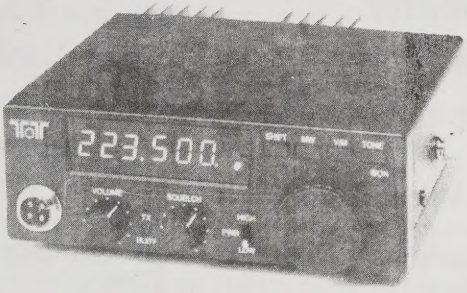
"I know I SHOULD be using a dummy load for this test. Will this giant surplus resistor work? What's the impedance of this big old light bulb?"

YES, a dummy load is the least exciting of all radio tools. But, there are those times when it's the right tool for the job. Your complex transceiver suddenly acts like a QRP rig: is it the rig, the tuner or the antenna? Loading the rig directly into the 1203 Dummy Load will report the basic health of your transmitter section. Save $$ by building this easy kit yourself. With many common-sense uses, this is the boring accessory you'll really appreciate whenever you start to wonder what's going on with ANY transmitter setup. Good for HF and VHF. C'mon: get one!

T-KIT No. 1203, $24.00, TEN-TEC No. 239, factory-assembled, $27.95

2 Meters Getting Crowded? Discover 220 MHz Action!

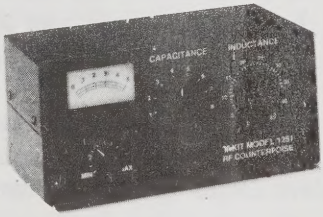
T-KIT Model 1230 220 MHz FM Transceiver



Engineered specifically for the 222-225 MHz band, using integrated 220 MHz RF power module for simplified construction and alignment. Front-panel switching of 4-5 watts or 20 watts RF output. Shop around: the Model 1220 is the lowest-priced 220 MHz rig on the market with the features you need and expect. Microprocessor-controlled, 15 memories, tunes 221.890 - 225.200 MHz in 10 KHz steps, plus Memory Scan. General operating features similar to Models 1220 and 1260.

See next page for more details and specs on T-KIT VHF FM Transceivers.

T-KIT Model 1230 20 Watt FM Transceiver Kit, $295.00
Includes microphone and mobile mounting bracket.

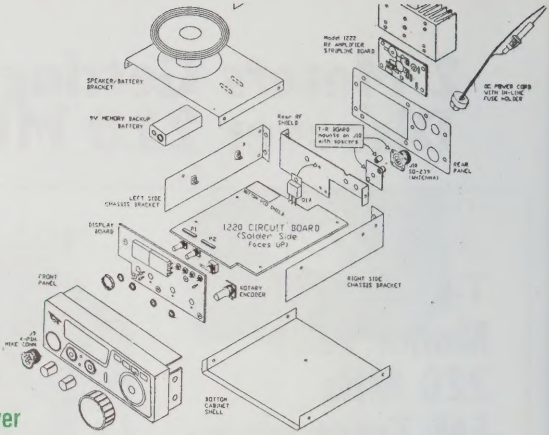


Compact RF Ground Counterpoise

At a fraction of the cost and size of other "artificial ground" gadgets, the T-KIT 1251 helps solve those annoying RFI/TVI and "hot chassis" problems caused by a lack of proper RF ground. Ideal for condo and travel situations where PVC plumbing makes classic waterpipe grounding schemes impossible, or if a good ground is too far away from the station. While NOT a substitute for a vertical's radial system or for the basic safety grounding required for all installations, it does provide a "tuned counterpoise" to satisfy the transmitter's need for a correct RF ground path.

T-KIT Model No. 1251, $49.00.

Build your own 15-Memory 2-Meter FM Transceiver for only $195!



The Model 1220 FM/Data Transceiver shows just how serious T-KIT is about filling the big void in ham radio kit-building. Why pay hundreds more? You do NOT have to rely on imports for a 2-meter FM transceiver with the modern features which today's hams take for granted. And you won't have to settle for the stripped-down performance of other VHF kit transceivers. You'll learn from building it how to take care of it yourself. Priced like a second rig, good enough to be your only rig!

T-KIT Model 1220 Transceiver Features:

- ❑ Advanced microprocessor-controlled design
- ❑ Front-panel knob tuning of 143.500-148.500 MHz in 5 KHz **(or 2.5 KHz) steps**
- ❑ **15 Memories** store frequencies with repeater offsets **AND subaudible tones!**
- ❑ Store up to FIVE non-standard TX offsets (CAP, MARS, etc.)
- ❑ Bright 6-digit LED display resolves to 5 KHz channel tuning steps
- ❑ LED indicators for TX Offsets, Simplex, RX Busy, TX On-Air, CTCSS tone **on**
- ❑ Built-in speaker PLUS external speaker jack
- ❑ Optimized, standardized packet circuitry, standard DIN connector
- ❑ **Hand Microphone and Mobile Mount . . . BOTH INCLUDED!**
- ❑ Build it now for 5 Watts or 30 Watts, or upgrade to 30 Watts later

- ❑ Contemporary molded front panel and steel case are standard, not extra!
- ❑ Instantaneous, silent PIN diode T-R switching
- ❑ Full CTCSS subaudible TX tone set **BUILT-IN**, microprocessor-controlled

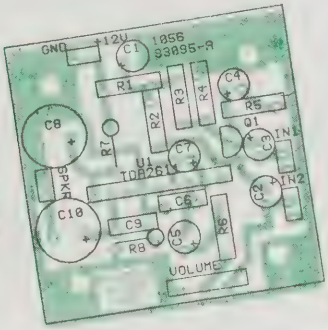
Model 1220 Typical Specifications: Sensitivity .2 μV for 12 dB SINAD ● Deviation ± 5 KHz ● Dynamic range: 70 dB (2 tone, 3rd order IMD @ 20 KHz from 146 MHz) ● Adjacent channel rejection: 70 dB (@ 20 KHz from 146 MHz).

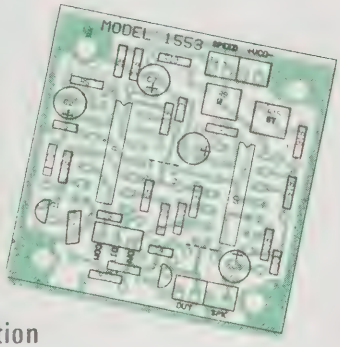
T-KIT Model No. 1220 Transceiver Kit, 5 Watts RF Output, $195.00

No. 1222 30 Watt RF amplifier module kit for Model 1220, $64.00

For Creative Kit-Builders . . .

T-KIT MODULE BOARDS





As T-KIT continues the Tradition
of Heathkit, Knight, WRL, Layafette and those other grand kits
complete with all hardware and enclosure
there still is the other tradition of
simpler kits with PC-board, primary parts and instructions only,
designed for those who prefer to find their own kit-finishing hardware.
That's why we bring you T-KIT MODULE BOARDS,
the very best in "little kits" for careful budgets!

These "smaller" but carefully-engineered T-KIT boards
are for hams and experimenters who use their own hardware and ingenuity to custom-finish a project. You get the circuit board with all needed I/O pads, all board-mounted parts, a well-engineered circuit and the same high-quality step-by-step instruction manual that is the hallmark of all T-KITS. Finish the job with your own switches, connectors and enclosure, or get a great head-start with a T-KIT *Enclosure-PLUS* Hardware Pak featuring TEN-TEC's easy-to-use blank aluminum boxes, plus a useful assortment of finishing hardware and components.

See Pages 12-16:
T-KIT MODULE BOARDS . . . the very BEST in "Little Kits"!

❑ Transmatch Tuning Bridge

Have you ever wondered what good one of those $60-100 "R-X Noise Bridges" could do for YOUR station setup? Are you baffled by your antenna tuner or "transmatch"? The 1051 is easy to build and super-easy to use. No "R-X" controls, calibration or calculations needed. Just connect it between your rig and antenna tuner, set receiver to desired operating frequency, and adjust the antenna tuner until the distinctive *modulated pulses* (NOT just straight "noise"!) drop to an easily-recognized "null" indicating that the tuner offers a 50-ohm match to your transceiver -- with NO on-the-air nervous experimenting with the tuner controls!

T-KIT No. 1051, $17.00

Suggested Enclosure-Plus Pak, No. 1000A, $15.50

❑ Foxhunt "Beep-Beep" Transmitter (for FM Broadcast Band)

Here's a great gadget at a great price for clubs, classes, scout troops and packs, camps and family fun! Tune it to any quiet part of the 88-108 MHz FM band per FCC Part 15 rules, noticing its distinctive "beep-beep" modulation, and let the kids use their own FM portable radios to discover the basics of direction-finding. Hide it indoors on rainy days! Includes board-mounted on-off switch and 9V battery snap. Use several to demonstrate triangulation.

T-KIT No. 1059, $12.00.

❑ Budget Electronic Keyer

A classic circuit and a nice price make this a great project for beginners or for building into extra rigs. Includes speed control, weight control (rarely offered in "simple" CMOS circuits) and sidetone pitch control. A lot-of keyer for the price, it features self-completing dits and dahs for standard single-lever keyer paddles. While not designed for iambic operation, the price and reliability make the 1553 a very nice introduction to electronic CW keying.

T-KIT No. 1553, $12.00

Suggested Enclosure-Plus Pak, No. 1000A, $15.50

(Also may be mounted inside TEN-TEC Keyer Paddle, Model 607, $39.00.)

T-KIT, a division of TEN-TEC, Inc.

1185 Dolly Parton Parkway • Sevierville, TN 37862 •

T-KIT Enclosure-*PLUS* Hardware Paks

With three sizes to fit all T-KIT Module Boards, these nifty Enclosure-PLUS Hardware Paks give you real choices for dressing up your small kit projects:

- ❑ Dig through and make good use of your own parts collection
- ❑ Shop at Radio Shack, local distributor or next hamfest
- ❑ Enjoy the practicality of a T-KIT **Enclosure-*PLUS*** Hardware Pak

ALL Enclosure-PLUS Hardware Paks include: TEN-TEC TP-series aluminum box suitable for your project, mechanical hardware, plus helpful toggle switches, knobs, etc. You may get more than needed for the one project: add the extra goodies to your parts drawers for your next T-KIT MODULE BOARD project!

Connectors: Since there are so many **different** hookup methods useable for RF, DC, audio, and other connections, we must leave it up to you (or your Radio Shack store, ham buddy or hamfest) to choose what's handiest for rear-panel hookups.

THREE Convenient T-KIT Enclosure-PLUS Hardware Pak sizes:

- ❑ T-KIT No. 1000A (standard), $15.50
  [TP19 box (2X4¾X4"), DPDT toggle, wire/mini-coax pak, knob, misc. hardware]
- ❑ T-KIT No. 1000B (medium), $19.50 [tops in value and general usefulness]
  [TP41 box (2¼X5½X4¼"), DPDT & SPDT, 3 knobs, wire/coax pak, hardware]
- ❑ T-KIT No. 1000C (deluxe), $22.50 [for 1056 receiver, similar projects.]
  [TP45 box (2¾X6½X5½"), SPDT, wire/coax/hardware, 5 knobs, 3" speaker]

❑ "Smart Squelch" Band Opening Alert

Also known as the DXer's "Integrating Squelch," this great circuit liberates your family from hiss, whines and other noises when your receiver is tuned for those unpredictable openings on any HF or VHF band that usually seems DEAD. This "integrating" squelch responds to the cumulative effect of several seconds of weak signal rather than to isolated noise bursts. Connect between rig and external speaker; no receiver modification required. You supply creative 12VDC alarm devices (piezo, chime, strobe light, etc.) Also may be used to add conventional squelch feature to older receivers, any mode. (Strong signals break squelch quickly.)

T-KIT No. 1064, $19.00

Suggested Enclosure-Plus Pak, No. 1000A, $15.50

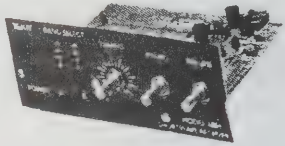
A New World of Budget-Priced Receiver Projects!

❑ Universal BFO for SWL Receivers

Got an old (or very new) AM-only shortwave radio with no CW-SSB capability? If you want to enjoy casual CW-SSB reception, this varactor-tuned 455 KHz oscillator may be built into larger receivers or else mounted in its own case and placed near your portable SWL radio. The on-board tuning control compensates for alignment variations from one receiver to another in addition to permitting fine-tuning of SSB/CW signals. Operates on 6 to 15 VDC.

T-KIT No. 1050, $9.00

Suggested Enclosure-Plus Pak, No. 1000A, $15.50



❑ Regenerative 4-Band SWL Receiver

(Kit INCLUDES drilled, painted, silkscreened aluminum front panel!)

Here it is: PROOF that the classic "first receiver" project need not be more expensive today than our favorite 1950's kits. In fact, this great little receiver beats the pants off those 3-tube radios with the big plug-in coils. Excellent for clubs, classes and family activities. Band coverage: 49 Meter SWL band, 40 Meter ham band, 31 Meter SWL band, plus exciting 12-15 MHz tuning for daytime shortwave listening, 20 Meter ham band and all those other magical shortwave sounds. The sharp-looking front panel gives the "real radio" look right away: dress up your project later with a case and knobs, and perhaps a speaker. You can enjoy the basic kit just by hooking up 9 to 12 volts DC, setting up a modest wire antenna (10 feet or more of hookup wire) and plugging in your own stereo headphones (1/8" plug). Features convenient push-button bandswitching, on-off switch, "on" LED, tuning, volume, regeneration control.

T-KIT No. 1054, $24.00

Suggested Enclosure-Plus Pak, No. 1000B, $19.50

Attention, Club Leaders! No. 1054C **T-KIT CLASS-Pak:**
Includes five 1054 Receiver Kits, Instructor's Notes, Spare-Parts Kit, $110.00.

❑ 6-to-10 Meter Receiver Converter

Get more fun and use out of that often-idle 10-Meter mobile rig or ANY ham transceiver (or receiver) with a good 10-Meter capability. Take FULL advantage of your rig's sophisticated features to enjoy low-cost monitoring of 6-Meter's fascinating propagation. Build this crystal-controlled converter at a fraction of the cost of other kits. Receive any mode available on the transceiver itself. 28-30 MHz receiving range tunes 50-52 MHz. Runs on 9-15 VDC.

T-KIT No. 1061, $17.00

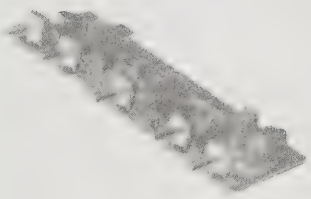
Suggested Enclosure-Plus Pak, No. 1000A, $15.50

❑ "ANY BAND" Direct-Conversion SSB/CW Receiver

This is your *best buy, by far*, in a ham band direct conversion receiver kit. It has better audio and filtering than the others, and we supply the parts and instructions to let you build it for (or change it to) ANY band of your choice. That's Right: YOU choose the Band! Many hams KNOW that there are only minor coil and capacitor differences in the simple RF input and oscillator sections of a basic direct-conversion receiver. We give you ALL parts needed to build for your choice of 160, 80, 75, 40, 30, 20, 17, 15, 12 or 10 meters! Try out your own multi-band switching ideas. Start planning a budget-priced QRP transceiver that will really WORK!

Note to Beginners: Contrary to some advertising claims, a direct-conversion receiver is very good for CW/SSB but **cannot** provide very pleasant listening for shortwave AM broadcasts (BBC, Radio Moscow, VOA, etc.) For general listening, we suggest T-KIT Model No. 1054 or No. 1253.

Model 1056 Receiver Design Features:



- ❑ Signetics NE612 mixer-oscillator
- ❑ True varactor tuning (MV209)
- ❑ Zener diode regulation
- ❑ LM358 op amp bandpass filter
- ❑ Front-panel bandpass control
- ❑ Signetics TDA2611A audio amplifier IC
- ❑ Stereo jack for economical "Walkman" headphones
- ❑ Plenty of speaker audio
- ❑ **Separate "Bandset" and s-m-o-o-th 20 KHz "Bandspread" tuning controls!**
- ❑ RF gain control
- ❑ Provision for TX sidetone injection
- ❑ Provision for receiver audio muting during transmit
- ❑ Efficient 6"W X 2½"D board layout, take your favorite ham band ANYWHERE!
- ❑ Jumper provision for separate DC supply to audio IC
- ❑ Operates on 12-15 VDC

T-KIT No. 1056, $29.00
Suggested Enclosure-Plus Pak, No. 1000C, $22.50

❑ Active Antenna for Receivers

If you've been curious about what an "Active" receiving antenna can or cannot do, without paying the $40-$100 cost typical of both kit and manufactured units, you will enjoy the experience of building, learning about and using this very simple, budget-priced kit. Just for fun, we carefully tested this little T-KIT 1552 Module board next to active antennas sold by Heath, MFJ, Ramsey. Wow: you'll get the performance without the price tag! Bring ANY HF receiver to life with the 1552 and a small length of wire, or a simple whip antenna! Compact 1.75" square board can be mounted inside receiver or in its own small box. Circuit includes gain control; operates on 6 to 15 VDC.

T-KIT No. 1552, $12.00
Suggested Enclosure-Plus Pak, No. 1000A, $15.50

❑ Universal Low-Noise Broadband DC to 1 GHz RF Preamp

You KNOW that every kit company sells some sort of broadband preamp for all purposes. If you want to try a broadband, untuned RF preamp on any receiver or scanner or other instrument, THIS one is your best buy! Excellent noise figure, gain and frequency coverage *at a BUDGET PRICE!* Up to 18.5 dB gain at 100 MHz. 17 dB gain typical at 500 MHz. Supply voltage: 8-14 VDC.
T-KIT No. 1001, $9.00

❑ Utility Audio Amplifier

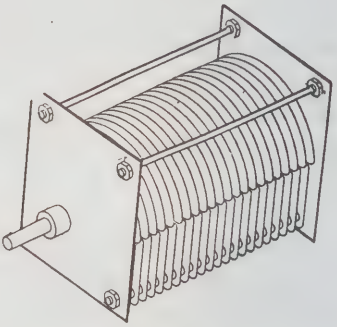
Need a quick, reliable, inexpensive audio amplifier stage for that homebrew project? This careful design *gives your project the very same audio output circuit that we use in today's TEN-TEC transceivers!* Enjoy 1.5 watts of low-distortion audio with no worry about motorboating and other unwanted oscillations. Includes optional preamp input for 10 dB gain. Important: this circuit is designed for 12-15 VDC.
T-KIT No. 1550, $10.00

❑ Microphone Speech Processor

While speech processing IS a standard feature of today's SSB transceivers, there's plenty of nice equipment at hamfest flea-markets which can benefit significantly from the addition of this proven speech processor circuit used in all of today's TEN-TEC transceivers. If there's room, build it into that older rig. Or, design it into that audio console you've been planning, or just use a neat TEN-TEC box!
T-KIT No. 1551, $12.00
Suggested Enclosure-Plus Pak, No. 1000A, $15.50

YES! You can build a . . .

High-Power Variable Capacitor

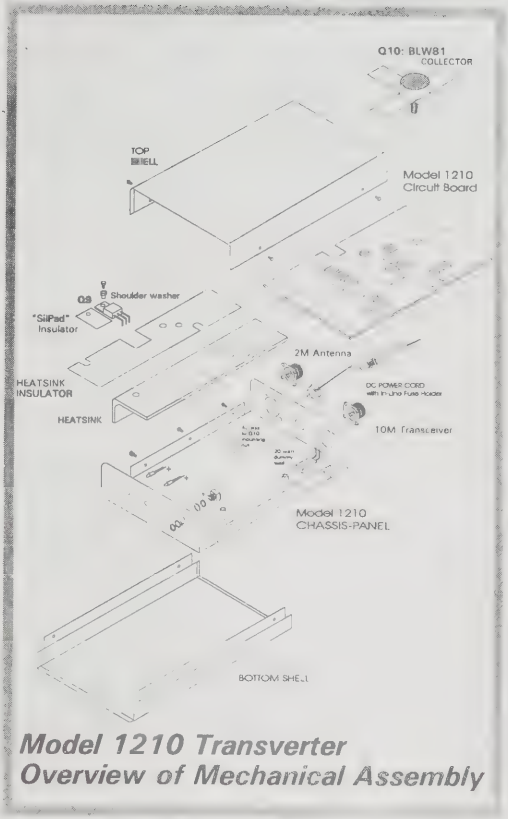


❑ 40-500 pF
❑ Rated 3.5 KV

What? Me BUILD a capacitor? Air-variable capacitors cost **$$$** these days ***because of all the hand labor of putting them together.*** If you'd like to spend part of an evening reliving those grand old Erector Set days, save money by assembling your own high-power variables from our top-quality factory-ware. Build the same tuning capacitors used in world-class TEN-TEC 1.5KW RF amplifiers and tuners. Great for all hi-power homebrew projects, including experimental loop antennas.
T-KIT No. 1207, $39.00 (TEN-TEC assembled No. 80-858, $58.00.)

Operate 2 Meters in Any Mode with Your 10 Meter Transceiver!

For only $139, add 2 meters to any HF transceiver. Ideal new use for those idle 10 meter mobile rigs.
Full 10 watts RF output.
ALC-controlled 10M input handles power range of 4 to 20 watts.
Solid-state T-R switching.
Engineered from scratch for optimized 10M-2M conversion performance.
Compact: 1.5"H x 5"W x 8"D.



Model 1210 Transverter
Overview of Mechanical Assembly

Model 1210 Specifications:

- **Frequency Coverage:** 144-148 MHz band, typically 144-145.7 MHz, based on 28-29.7 MHz tuning range of most 10 meter transceivers. 116 MHz local oscillator.
- **Power requirement:** 12-14VDC, 100 mA. receive, 600 mA in transmit with no drive, 2.0A on transmit at 10 watts output.
- **Construction:** Black texture painted clamshell-type steel top and bottom, aluminum panel/chassis and heatsink. One 5.5"X3.75" double-sided circuit board.
- **Semiconductors:** 2 IC's, 13 transistors, 25 diodes. RF final: BLW81.

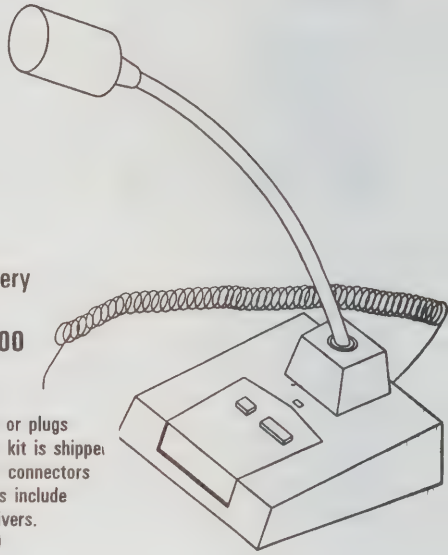
TRANSMIT:
- **RF Output:** 10 watts maximum on CW and FM, 10 watts PEP on SSB.
- **T/R Switching:** solid state, RF sensing.
- Output Power Adjustment Range: 2 to 10 watts.
- **Spurs and Harmonics:** Greater than -56 dBc at 10 watts out.
- **Standard TX Hang Time:** Approximately 1 second.
- **Input Drive:** Less than 0.5 watts input to key TX mode. 4 watts input for 10 watts output. Input drive level is ALC controlled between 4 and 20 watts. Input SWR less than 1.5:1.

RECEIVE:
- **Noise figure:** less than 2 dB. ● **Conversion Gain:** Approximately 17 dB.
- **Image Rejection:** Greater than 60 dB. ● **Input Intercept:** -6.5 dBm typical.

T-KIT Model 1210 10M-2M Transverter KIT, $139.00.
Model 1210A Factory Assembled, $239.00

Communications Desk Microphone

If you want your station to have the same quality of desk mike expected by demanding TEN-TEC transceiver users, at a great price savings, here's your chance to build and learn all about a proven desk-style comnunications mike that will complement any HF or VHF transceiver.



T-KIT 1201 Mike Features:

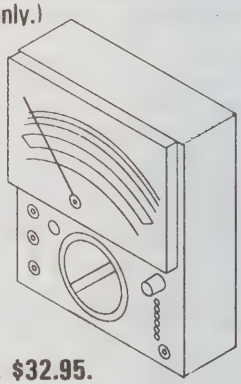
- ❑ Choice of PTT or VOX operation
- ❑ Electronic lock and release of PTT
- ❑ Sensitive op-amp preamplifier
- ❑ LED "on" indicator
- ❑ Type: Electret Condenser
- ❑ Sensitivity: -52 dBV/1 μbar
- ❑ Uses 7-14 VDC from rig or internal 9V battery

T-KIT No. 1201 Desk Microphone Kit, $59.00
TEN-TEC Model 705 (factory wired/tested), $79.95

MIKE CONNECTORS: Because various styles of connectors or plugs are used in ham and audio equipment, the 1201 microphone kit is shippe WITH shielded coil cable but less connector. Most standard connectors are stocked by RadioShack™. Current TEN-TEC microphones include 4-pin connector standard for all TEN-TEC and T-KIT transceivers.
TEN-TEC No. 35057, 4-pin microphone connector, $3.00

Economical Multitester

We found this great value in a taut band, mirrored scale VOM with handy extra features. We were so impressed with its performance that we decided to offer it for sale to our kit customers. (Not a kit: factory-assembled only.)



- ❑ 20,000 ohms/volt
- ❑ DC volts: 0.1, 0.5, 2.5, 10, 50, 250, 1000
- ❑ DC current: 50μA, 2.5, 25, 250 mA, 10A
- ❑ Resistance to 20 megohms
- ❑ AC volts: 10, 50, 250, 1000
- ❑ Audible continuity checker
- ❑ hFE transistor testing
- ❑ Built-in Battery Tester
- ❑ Rear panel pop-out stand
- ❑ 4"W X 6"H X 1.5"D

TEN-TEC Model 1130 Multitester, factory-assembled, $32.95.

Order Kits by PHONE • FAX • MAIL!

Minimum Order: $15.00 (plus shipping)

Inquiries or Information: 1-865-453-7172

8:00 AM - 5:30 PM Eastern/EDT, Monday-Friday

Credit Card Orders: 1-800-833-7373 (Orders ONLY, please!)

FAX orders or inquiries: 1-865-428-4483

☐ Check here if this is your first order of any kind DIRECT from TEN-TEC.

NAME _____ Callsign _____ *

STREET ADDRESS _____

UPS requires STREET address for delivery

CITY _____ STATE ____ ZIP _____

DAYTIME phone or fax number: ( ) _____

* Amateur Radio license required to use transmit-capable T-KIT products.

Quantity	T-KIT No.	Description	Weight	Price Each	Amount

Total Weight of order: _____ **Lbs. TOTAL:** $_____

SHIPPING per Charts: _____

Tennessee Customers must add 8.5% State tax: _____

TOTAL PAYMENT ENCLOSED / credit card authorization: _____

SHIPPING (see Weight Chart):

Total order weight:	1-4 lbs.	5-10 lbs.	11-20 lbs.	Over 20 lbs:
48 States	$6.00	$9.00	$12.00	*Please call*
AK,HI, Canada	$15.00	$19.00	$23.00	*for quote*

48 States shipped via UPS surface or U.S. Mail. AK and HI shipped 2nd Day Federal Express. Canada shipped by air mail unless UPS specifically requested.

PAYMENT BY:

☐ Check ☐ Money Order ☐ VISA ☐ Mastercard ☐ Discover

Card No. _____ Expiration Date _____

1. All payments must be in U.S. Dollars (Sorry, NO C.O.D.)

2. Kit parts are warranted for one year to be free from manufacturing defect.

3. Any T-KIT may be examined, returned complete and UNASSEMBLED in fully-reuseable condition, within 30 days of shipment date, for full credit or refund, less original shipping/handling charge. Customer pays return shipping.

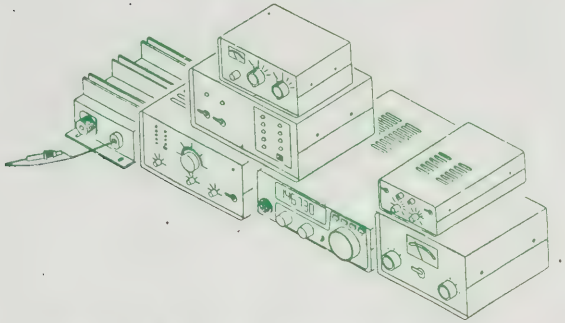
Visit our website: www.tentec.com

SHIPPING WEIGHTS

KIT	PAGE	LBS.
1000A	13	1
1000B	13	1
1000C	13	2
1001	13	1
1050	14	1
1051	12	1
1054	14	1
1054C	14	2
1056	15	1
1059	12	1
1061	14	1
1064	13	1
1130	18	2
1201	18	1
1202	8	3
1203	8	1
1207	16	2
1208	4	4
1208A	4	4
1209	5	4
1209A	5	4
1210	17	4
1210A	17	4
1220	10	5
1222	11	1
1230	9	5
1251	9	3
1252	6	3
1253	6	4
1254	3	5
1260	5	5
1320	7	4
1330	7	4
1340	7	4
1380	7	4
1550	16	1
1551	16	1
1552	15	1
1553	12	1

T-KIT
A Division of **TEN-TEC**, Inc.
1185 Dolly Parton Parkway
Sevierville, TN 37862-3710

Now, it's time for T-KITS!



While the Ham/Electronics World has been lamenting the grand old days of kit-building, the TEN-TEC team of hams, engineers and technicians has been working to bring those days back to you!

FIRST CLASS MAIL

TO:

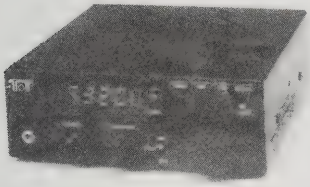
T-KIT Catalog No.
A2000

T-KIT

A Division of **TEN-TEC**, Inc.

Manufacturer of AMERICA'S BEST Amateur Radio Transceivers

NEW! Model 1254
100 kHz - 30 MHz
Receiver, page 3



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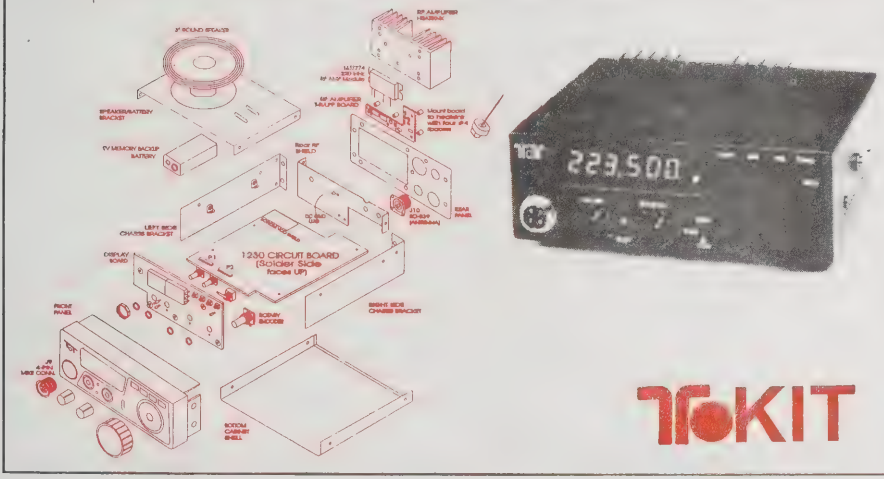
2 meter 17

T-KIT by TEN-TEC

Today's proven standard in ham radio kit building



T-KIT

TEN-TEC, Inc.
1185 Dolly Parton Parkway, Sevierville, TN 37862-3710
Information ● 1-423-453-7172
Fax ● 1-423-428-4483
Credit Card Orders Only ● 1-800-833-7373
Email ● sales@tentec.com

Visit our website: **www.tentec.com**

While the ham/electronics world has been lamenting the grand old days of kit-building, the TEN-TEC team of hams, engineers and technicians has been working to bring those days back to you!

TEN-TEC is the RIGHT company to bring you the very best in electronic kit-building using today's top technologies. We have 30 years of experience with the rapid changes in ham radio, and we stand today as the primary USA manufacturer of amateur transceivers . . . from the world-class Omni-VI Plus to the affordability of our take-anywhere "Scout." We manufacture enclosures, hardware, and even transformers in our own plant and we have a legendary reputation for customer support. In fact, we're the only major transceiver manufacturer which encourages you to open up your rig and fix problems yourself with our friendly help.

We've watched the kit industry with interest since our beginning. In fact, when he was president of Electro-Voice™, our chairman, Al Kahn, lent a hand and a big load of parts to some Michigan pals starting up a post-War company they named Heathkit™.

The 100 people in the TEN-TEC manufacturing plant promise you these three things absolutely ***essential*** *to any electronics kit product:*

1. **Quality engineering design**
2. **Careful packing of kit parts**
3. **Clear, informative instruction manuals**

Become our partner in this adventure of restoring the USA kit-building tradition — by following directions attentively, using that ever-proud American craftsmanship as you build!

WELCOME TO A NEW WORLD OF KIT-BUILDING
from just some of us here at TEN-TEC . . .

AL KAHN, K4FW, Chairman
Jack Burchfield, K4JU, President
Tom Salvetti, KC3NF, Vice-President, Marketing
Dan F. Onley, K4ZRA, Director, T-KIT Division

Larry Worth, WA4BSM, Production Manager, Manufacturing and T-KIT Packaging
Paul Clinton, WD4EBR, Service Manager
Mike Webber, KE4VSQ, T-KIT Engineering
Lee Jones, WB4JTR, Analog/RF Engineering
Larry Boyd, WB4ZXQ, Analog/RF Engineering
Boyd Lichlyter, KE4MCF, Analog/RF Engineering
Hardy Shelton, KA4RHX, Analog/RF Enginering
Gary Barbour, AC4DL, Digital/RF Engineering
Eric Guinn, AC4LS, T-KIT Engineering
Garry Green, N4CJX, Technician

Chyanne Prouty, KF4HHN, QC Inspector
Don Prouty, KF4HHO, Technician
Garland Jenkins, KA4ODE, Asst. Service Mgr.
Steve McCoy, KC4UJA, Technician
Dave Dellinger, KQ4ZJ, Technician
Scott Robbins, W4PA, Amateur Radio Products Manager
Stan Brock, WDØBGS, Customer Service
Raymond Henry, AA4LL, Customer Service

TEN-TEC
. . . America's Best!

Enjoy TEN-TEC Receiver Quality with Digital Tuning for Worldwide AM-SSB-CW, from 100 kHz to 30 MHz!

T-KIT Shortwave Receiver Model 1254: only $195 and the smoothest kit-building experience you can imagine!

The grand tradition of receiver kit building is no longer confined to direct-conversion or regenerative designs! The Model 1254 combines the satisfaction of a serious kit building experience with the performance features expected in a modern HF receiver at a very competitive price. You will build a true dual-conversion superhet with a microprocessor-controlled frequency synthesizer. Building this receiver yourself gives you the assurance that you can maintain it in perfect working order.

BUILDING SKILL LEVEL: Intermediate ● BUILDING TIME: 20 to 25 hours

- **Frequency coverage:** 100 kHz to 30 MHz ● **Modes:** AM, SSB/CW
- **Main Tuning:** Normal or Fast tuning (2.5 kHz SSB, 5.0 kHz AM, or 100 kHz steps for either mode)
- **"Clarifier" Control:** for ±1.5 kHz SSB/CW fine tuning between 2.5 kHz steps.
- **Front panel controls:** On/off switch, Tuning, Volume, Clarifier, Mode Select, Memory Write (MW), VFO/Memory tuning select (V/M), Tuning Rate Select (SPEED)
- **Memories:** 15 programmable memories
- **Circuit:** Synthesized 45-75 MHz local oscillator ● 45 MHz first I-F, 455 kHz second I-F
- **Sensitivity:** AM mode: 2.5 μV for 10 dB SNR at 30% modulation
  SSB/CW mode: 0.5 μV for 10 dB SNR ● **Selectivity:** 4 kHz @ -6 dB
- **Frequency/Memory Display:** 6-digit green LED with mode indicators
- **Power supply:** 12-15 VDC, 250 mA current consumption with no signal present
  15VDC @800 mA wall transformer supply *included* with kit.
- **Antenna connector:** 50 ohm input, RCA-style phono jack
- **Audio:** 1.5 watts audio output to internal speaker, plus 1/8" stereo phone jack for standard personal headphones or direct feed to 4-8 ohm external speaker, data interface or both.
- **Semiconductors:** 10 IC's, 26 transistors, 16 diodes
- **Compact Size:** 2.25" x 6.5" x 6.5" (HWD)
- **Construction:** Steel clamshell case, aluminum chassis, custom-molded front panel.

EASY ALIGNMENT!

Yesteryear's serious superhet receivers involved many dozens of alignment points, usually requiring professional service equipment, often scaring away the casual hobbyist. To "align" your state-of-the-art Model 1254, you need only a VOM and your ear! During kit construction, we provide **Progress Tests** for each of the 6 Assembly Phases. The receiver generates its own built-in 45 MHz test signal.

T-KIT Model 1254 Shortwave Receiver KIT: $195.00
(Includes all parts, DC power supply, Kit Manual, SWL Guide and Log booklet)

Let's Get Together and REPOSSESS 6 Meters!

How long can FOUR WHOLE MEGAHERTZ of precious semi-HF VHF spectrum just sit there for us hams if so few of us have gear to even try out this fascinating 6 Meter band? The T-KIT 1208 Transverter lets new Technicians and oldtimers alike repossess 6 Meters at a VERY nice price!

SSB-CW-FM **6-Meter Transverter**

Add the excitement of the 50 MHz amateur band so easily to ANY modern ham transceiver, including all those 20-Meter-only QRP rigs. A transverter lets you transmit as well as receive on 6 Meters, using the precision digital tuning, available modes, memories and other features of your HF transceiver. It's simple: 14.000 MHz on your display or dial is 50.000 MHz. To operate SSB on 50.200 MHz, simply switch the 1208 to 6 Meters, tune to 14.200, keep transceiver RF output under 5 watts, and just go for it! The 8 Watts RF output is generous power during good band openings and for local communications and repeaters.

Features:

- ❑ Use with any transceiver capable of 3-5 watts on 20 meters
- ❑ Extremely simple hookup and operation
- ❑ Low-noise 50-54 MHz receiving input
- ❑ Easy front-panel switching between HF and 6M antennas
- ❑ Fast, silent RF-sensing PIN diode T-R switching for QSK and data communication

Specifications and Operating Requirements: 12-15VDC at 3.0 amperes external DC power requirement • RF output at 51 MHz: 8 watts typical • standard 20M transceiver required for basic 50.000 50.150 MHz Beacon/CW/SSB operation • FM operation requires FM transmit/receive capability of a general coverage transceiver capable of 14-16 MHz operation, with repeater offsets being a function of the transceiver's VFO memory system • Receive 50-54 MHz; transmit 50-52 MHz (transmitting above 52 MHz is not recommended) • the 14 MHz transceiver RF output MUST be attenuated to 5 watts or less.

T-KIT No. 1208, Six-Meter Transverter Kit, $95.00
No. 1208A, Assembled/Tested 6M Transverter, $159.00

JUST WANT TO LISTEN IN . . .

on 6 Meters on a budget? Try a fine little 6-Meter Receive Converter with any 10 Meter receiver or transceiver by building T-KIT Module Board No. 1061 for only $17.00. 28-30 MHz receiver coverage tunes 50-52 MHz. SEE **Page 14.**

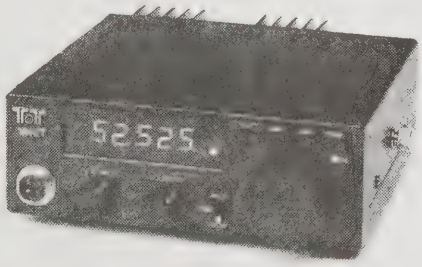
More Ways to explore 6 Meters

T-KIT Model 1209 Transverter: 8 watts RF output on 6 meters from your 2 meter rig or HT for only $95!

Newly-licensed hams: explore your operating privileges beyond 2 Meters VERY economically! Operate 50-54 MHz on any mode covered by your 144-148 MHz rig or HT. With the same general features and specifications as our popular 1208 6 Meter Transverter (see page 4), the Model 1209 was designed for those regions where 6M FM repeaters take the load off the busy 2M systems. And you may find yourself making cross-country simplex QSO's during those exciting 6M band openings.

Just think: only $290 gives you BOTH 2M and 6M if you build and use the 1220 Transceiver and 1209 Transverter! (See page 10)

T-Kit Model No. 1209 6 meter Transverter KIT, $95.00
Model 1209A, factory assembled, $159.00



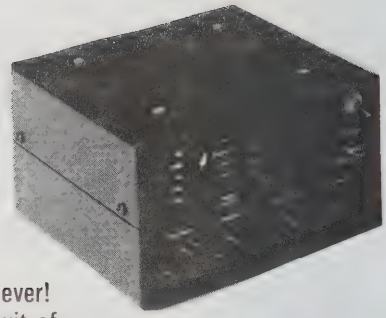
T-KIT Model 1260 6 Meter FM TRANSCEIVER for only $195!

- **15 programmable memories**
- **ready for 6M's varying transmit offset schemes**
- **microprocessor-controlled**
- **complete with microphone, internal speaker and mobile bracket**

Read about the Model 1220 2M transceiver (pages 10-11) and imagine the same great-looking rig ready for easy and fun 6M FM repeater or simplex action, no matter what kind of transmit offset scheme is employed! FCC regulations currently prohibit the sale of an add-on amplifier, but our many happy transverter owners can tell you that a few watts on 6M is a blast!

T-KIT Model 1260 5 Watt 6 meter Transceiver KIT, $195.00.

9-Band Shortwave Receiver



The classic "first radio kit" is back better than ever! We've combined the very same audio output circuit of TEN-TEC transceivers with a modern FET design for classic regenerative SWL receiving plus one-button electronic bandswitching. The result is an easy-to-build shortwave radio that's fun and interesting for the whole family. No alignment required. Simply install all parts as directed, put together the high-quality mechanical parts, and start enjoying the magic of shortwave radio. Explore 9 smooth-tuning SWL and ham bands from 1.8 to 22 MHz at the push of a ⏏ button! Receives AM, SSB, CW and all those other magical shortwave sounds.

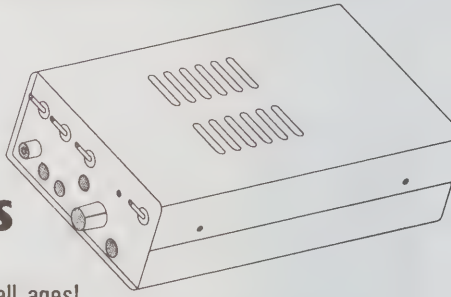
FEATURES: Front-panel RF gain, Volume, Regeneration, Tuning **and Fine-Tuning** controls ● generous audio from Signetics TDA2611A to built-in speaker or stereo phone jack ● Electronic switching of 9 tuning ranges ● rugged, rounded-clamshell steel enclosure ● simple, clear linear logging scale for large tuning knob ● requires 8 alkaline C cells or external 12VDC.

KIT No. 1253, $59.00

On a tight budget with a club of eager radio builders? Our 4-Band Model 1054 Module Board Kit has comparable features for only $24! See page 14.

Listen to the Mysterious Sounds of ENERGY!

Hi-Sensitivity Audio Amplifier with Experiments



A wonderful project kit for experimenters of all ages!

Build a rugged, versatile, portable utility amplifier (for which you'll find dozens of practical uses over the years). Then, begin to explore the fascinating world of the unique sounds made by all kinds of energy — from lightning whistlers on the other side of the world to the stress noise of a bending paperclip. Listen to radar, to light waves, to your computer. Listen to nearby radio signals on any frequency, any mode. In addition to the kit assembly manual, you get a fascinating project booklet based on experiments by USAF Engineer Calvin R. Graf as your guide to adventures with the sounds of Energy. Amp;ifier features hi and low Z inputs, switchable preamp, 1.5W output. Requires 8 "AA" batteries or external 12-15 VDC.

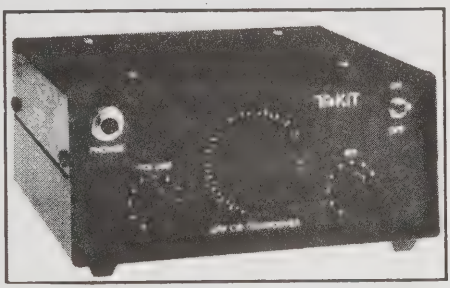
NOTE: The kit includes accessories for many of the energy listening experiments. You will need 1x2" wood (furring strips) and wire to build the 4' loop antenna explained in the project booklet.

T-KIT No. 1252, $44.00

Take your favorite CW band anywhere for only $95!

TEN-TEC began in 1968 with the release of very inexpensive "QRP" transceivers. We thought it would be fun to revisit those roots. We explored **today's** RF technology and components to see just how inexpensive, compact and simple a ***quality*** QRP kit rig could be. The low price and great receiver design make these QSK VFO-controlled transceivers a smart choice for those times and moods when you want to try out a few watts of RF output. Get on the air from the beach, or a mountaintop, or your office or dorm room!

A New Family of QRP CW Transceivers!



T-KIT Model 1320 for **20 Meters**, $95.00
T-KIT Model 1330 for **30 Meters**, $95.00
T-KIT Model 1340 for **40 Meters**, $95.00
T-KIT Model 1380 for **80 Meters**, $95.00

Frequency Coverage: VFO tuning of any 50 KHz segment of CW subband. Tuning range is selected during winding of one toroid in the VFO circuit.
Frequency Control: varactor tuned oscillator with potentiometer control. Temperature compensated LC components stabilize VFO.
RIT (receive incremental tuning): ±1.5 KHz.
Antenna: 50 ohm unbalanced, SO-239 connector.
Power requirement: 12-14VDC, 35 mA. receive (no signal), 80 mA receive (S-9 signal), 800 mA on transmit.
Construction: Black texture painted clamshell-type steel top and bottom, aluminum chassis, subpanel and heatsink. One 3.5"X5" double-sided circuit board.
Board-mounted Components: 216 including 4 IC's, 19 transistors, 13 diodes.
Front Panel Controls: main tuning, RIT, volume, DC on-off toggle.
Connectors: front panel 1/4" stereo phone jack; rear panel SO-239 for antenna, 3 RCA jacks for key, DC input, accessory DC output.
Dimensions: HWD 2.75"x6"x6". **Weight:** 2.25 lbs./1.02 kg.

TRANSMITTER:
- **RF Output:** 3 watts typical, no external adjustment ● **T/R Switching:** solid state, full break-in
- **CW offset and sidetone:** Adjustable 400-1000 Hz sidetone automatically tracks offset frequency. Sinewave sidetone has internal level adjustment.

RECEIVER:
- **Type:** single conversion superhet, JFET mixer ● **Sensitivity:** .25 μV typical for 10 dB S/N
- **Selectivity:** 4-pole crystal ladder filter (1 KHz nominal bandwidth)
- **AGC:** audio derived ● **IF frequency:** 11 MHz on 80 and 40 meter models; 14.32 MHz on 30 meter model; 6.14 MHz on 20 meter model.
- **Audio:** 300 mW @ 4 ohms built-in 3" speaker

20/200 Watt **SWR Bridge & RF Wattmeter** for BOTH 1.8-30 MHz AND 144-148 MHz!

Build this top-quality station accessory that you'll use for a long, long time. Features easy-to-read meter, front panel switching of 20 or 200 watt ranges, HF or 2-Meters, sensitivity control, four SO-239 antenna and transmitter connectors, all housed in a rugged steel enclosure less likely to bounce at the mercy of RG-8 coax! Range: 1.8 to 30 MHz *plus* 2 Meters! Separate HF and VHF connectors let you leave the unit in-line with BOTH rigs. Convenient toggle switching between HF and VHF. This is your USE-ANYWHERE RF Power/SWR meter system!

T-KIT Model 1202 SWR Bridge Kit, $49.00

No. 1202A, wired and tested, $74.00

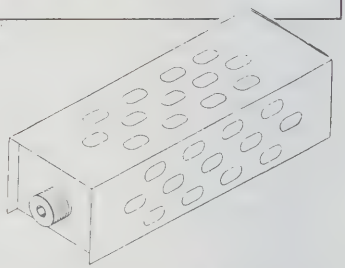
TEN-TEC . . . *America's Best!*

You have the common sense to know why TEN-TEC doesn't build into the cost of our radios the cost of giving away hats 'n stuff at hamfests. But, we're proud of the many requests we get for TEN-TEC caps, mugs, or other symbols of the made-in-USA pride that you share with the 100 folks at TEN-TEC. So, if you'd like our sharp looking, top-quality *embroidered* all-weather cap (gray, with black/red design), it's yours for a few $'s over our cost! Thanks for joining the TEN-TEC team!

TEN-TEC embroidered cap, adjustable band, $10.00.

RF Dummy Load

50-Ohm, 300 Watts



"I know I SHOULD be using a dummy load for this test. Will this giant surplus resistor work? What's the impedance of this big old light bulb?"

YES, a dummy load is the least exciting of all radio tools. But, there are those times when it's the right tool for the job. Your complex transceiver suddenly acts like a QRP rig: is it the rig, the tuner or the antenna? Loading the rig directly into the 1203 Dummy Load will report the basic health of your transmitter section. Save $$ by building this easy kit yourself. With many common-sense uses, this is the boring accessory you'll really appreciate whenever you start to wonder what's going on with ANY transmitter setup. Good for HF and VHF. C'mon: get one!

T-KIT No. 1203, $24.00, TEN-TEC No. 239, factory-assembled, $27.95

2 Meters Getting Crowded? Discover 220 MHz Action!

T-KIT Model 1230 220 MHz FM Transceiver

Engineered specifically for the 222-225 MHz band, using integrated 220 MHz RF power module for simplified construction and alignment. Front-panel switching of 4-5 watts or 20 watts RF output. Shop around: the Model 1220 is the lowest-priced 220 MHz rig on the market with the features you need and expect. Microprocessor-controlled, 15 memories, tunes 221.890 - 225.200 MHz in 10 KHz steps, plus Memory Scan. General operating features similar to Models 1220 and 1260.

See next page for more details and specs on T-KIT VHF FM Transceivers.

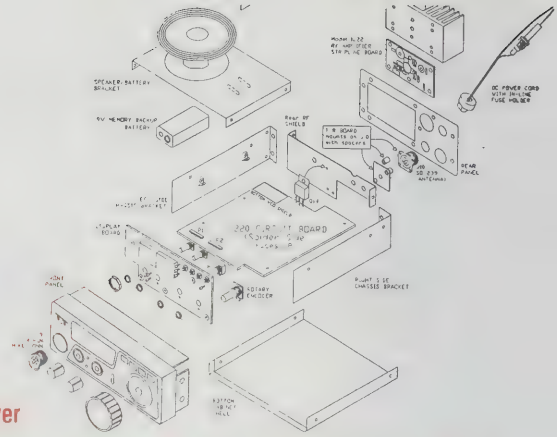
T-KIT Model 1230 20 Watt FM Transceiver Kit, $295.00
Includes microphone and mobile mounting bracket.

Compact RF Ground Counterpoise

At a fraction of the cost and size of other "artificial ground" gadgets, the T-KIT 1251 helps solve those annoying RFi/TVI and "hot chassis" problems caused by a lack of proper RF ground. Ideal for condo and travel situations where PVC plumbing makes classic waterpipe grounding schemes impossible, or if a good ground is too far away from the station. While NOT a substitute for a vertical's radial system or for the basic safety grounding required for all installations, it does provide a "tuned counterpoise" to satisfy the transmitter's need for a correct RF ground path.

T-KIT Model No. 1251, $49.00.

Build your own 15-Memory 2-Meter FM Transceiver for only $195!



The Model 1220 FM/Data Transceiver shows just how serious T-KIT is about filling the big void in ham radio kit-building. Why pay hundreds more? You do NOT have to rely on imports for a 2-meter FM transceiver with the modern features which today's hams take for granted. And you won't have to settle for the stripped-down performance of other VHF kit transceivers. You'll learn from building it how to take care of it yourself. Priced like a second rig, good enough to be your only rig!

T-KIT Model 1220 Transceiver Features:

- ❑ Advanced microprocessor-controlled design
- ❑ Front-panel knob tuning of 143.500-148.500 MHz in 5 KHz **(or 2.5 KHz) steps**
- ❑ **15 Memories** store frequencies with repeater offsets **AND subaudible tones!**
- ❑ Store up to FIVE non-standard TX offsets (CAP, MARS, etc.)
- ❑ Bright 6-digit LED display resolves to 5 KHz channel tuning steps
- ❑ LED indicators for TX Offsets, Simplex, RX Busy, TX On-Air, CTCSS tone on
- ❑ Built-in speaker PLUS external speaker jack
- ❑ Optimized, standardized packet circuitry, standard DIN connector
- ❑ **Hand Microphone and Mobile Mount . . . BOTH INCLUDED!**
- ❑ Build it now for 5 Watts or 30 Watts, or upgrade to 30 Watts later

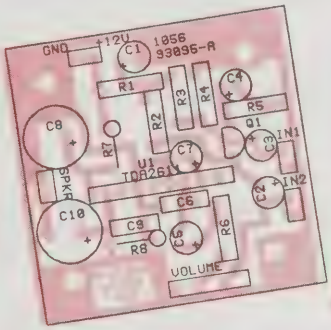
- ❑ Contemporary molded front panel and steel case are standard, not extra!
- ❑ Instantaneous, silent PIN diode T-R switching
- ❑ Full CTCSS subaudible TX tone set **BUILT-IN**, microprocessor-controlled

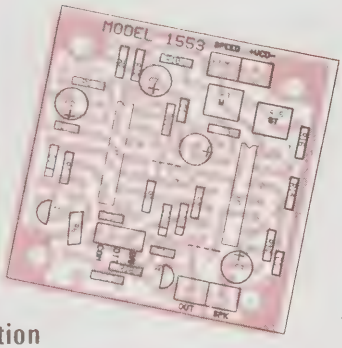
Model 1220 Typical Specifications: Sensitivity .2 μV for 12 dB SINAD ● Deviation ± 5 KHz ● Dynamic range: 70 dB (2 tone, 3rd order IMD @ 20 KHz from 146 MHz) ● Adjacent channel rejection: 70 dB (@ 20 KHz from 146 MHz).

T-KIT Model No. 1220 Transceiver Kit, 5 Watts RF Output, $195.00
No. 1222 30 Watt RF amplifier module kit for Model 1220, $64.00

For Creative Kit-Builders . . .

T-KIT MODULE BOARDS





As T-KIT continues the Tradition
of Heathkit, Knight, WRL, Layafette and those other grand kits
complete with all hardware and enclosure
there still is the other tradition of
simpler kits with PC-board, primary parts and instructions only,
designed for those who prefer to find their own kit-finishing hardware.
That's why we bring you T-KIT MODULE BOARDS,
the very best in "little kits" for careful budgets!

These "smaller" but carefully-engineered T-KIT boards are for hams and experimenters who use their own hardware and ingenuity to custom-finish a project. You get the circuit board with all needed I/O pads, all board-mounted parts, a well-engineered circuit and the same high-quality step-by-step instruction manual that is the hallmark of all T-KITS. Finish the job with your own switches, connectors and enclosure, or get a great head-start with a T-KIT *Enclosure-PLUS* Hardware Pak featuring TEN-TEC's easy-to-use blank aluminum boxes, plus a useful assortment of finishing hardware and components.

See Pages 12-16:
T-KIT MODULE BOARDS . . . the very BEST in "Little Kits"!

❑ Transmatch Tuning Bridge

Have you ever wondered what good one of those $60-100 "R-X Noise Bridges" could do for YOUR station setup? Are you baffled by your antenna tuner or "transmatch"? The 1051 is easy to build and super-easy to use. No "R-X" controls, calibration or calculations needed. Just connect it between your rig and antenna tuner, set receiver to desired operating frequency, and adjust the antenna tuner until the distinctive *modulated pulses* (NOT just straight "noise"!) drop to an easily-recognized "null" indicating that the tuner offers a 50-ohm match to your transceiver -- with NO on-the-air nervous experimenting with the tuner controls!

T-KIT No. 1051, $17.00

Suggested Enclosure-Plus Pak, No. 1000A, $15.50

❑ Foxhunt "Beep-Beep" Transmitter (for FM Broadcast Band)

Here's a great gadget at a great price for clubs, classes, scout troops and packs, camps and family fun! Tune it to any quiet part of the 88-108 MHz FM band per FCC Part 15 rules, noticing its distinctive "beep-beep" modulation, and let the kids use their own FM portable radios to discover the basics of direction-finding. Hide it indoors on rainy days! Includes board-mounted on-off switch and 9V battery snap. Use several to demonstrate triangulation.

T-KIT No. 1059, $12.00.

❑ Budget Electronic Keyer

A classic circuit and a nice price make this a great project for beginners or for building into extra rigs. Includes speed control, weight control (rarely offered in "simple" CMOS circuits) and sidetone pitch control. A lot of keyer for the price, it features self-completing dits and dahs for standard single-lever keyer paddles. While not designed for iambic operation, the price and reliability make the 1553 a very nice introduction to electronic CW keying.

T-KIT No. 1553, $12.00

Suggested Enclosure-Plus Pak, No. 1000A, $15.50

(Also may be mounted inside TEN-TEC Keyer Paddle, Model 607, $39.00.)

T-KIT, a division of TEN-TEC, Inc.

1185 Dolly Parton Parkway • Sevierville, TN 37862 • (423) 453-7172

T-KIT Enclosure-*PLUS* Hardware Paks

With three sizes to fit all T-KIT Module Boards, these nifty Enclosure-PLUS Hardware Paks give you real choices for dressing up your small kit projects:

- ❑ Dig through and make good use of your own parts collection
- ❑ Shop at Radio Shack, local distributor or next hamfest
- ❑ Enjoy the practicality of a T-KIT **Enclosure-*PLUS*** Hardware Pak

ALL Enclosure-PLUS Hardware Paks include: TEN-TEC TP-series aluminum box suitable for your project, mechanical hardware, plus helpful toggle switches, knobs, etc. You may get more than needed for the one project: add the extra goodies to your parts drawers for your next T-KIT MODULE BOARD project!

Connectors: Since there are so many **different** hookup methods useable for RF, DC, audio, and other connections, we must leave it up to you (or your Radio Shack store, ham buddy or hamfest) to choose what's handiest for rear-panel hookups.

THREE Convenient T-KIT Enclosure-PLUS Hardware Pak sizes:

❑ T-KIT No. 1000A (standard), $15.50
[TP19 box (2X4¾X4"), DPDT toggle, wire/mini-coax pak, knob, misc. hardware]

❑ T-KIT No. 1000B (medium), $19.50 [tops in value and general usefulness]
[TP41 box (2¼X5½X4¼"), DPDT & SPDT, 3 knobs, wire/coax pak, hardware]

❑ T-KIT No. 1000C (deluxe), $22.50 [for 1056 receiver, similar projects.]
[TP45 box (2¾X6½X5½"), SPDT, wire/coax/hardware, 5 knobs, 3" speaker]

❑ "Smart Squelch" Band Opening Alert

Also known as the DXer's "Integrating Squelch," this great circuit liberates your family from hiss, whines and other noises when your receiver is tuned for those unpredictable openings on any HF or VHF band that usually seems DEAD. This "integrating" squelch responds to the cumulative effect of several seconds of weak signal rather than to isolated noise bursts. Connect between rig and external speaker; no receiver modification required. You supply creative 12VDC alarm devices (piezo, chime, strobe light, etc.) Also may be used to add conventional squelch feature to older receivers, any mode. (Strong signals break squelch quickly.)
T-KIT No. 1064, $19.00
Suggested Enclosure-Plus Pak, No. 1000A, $15.50

A New World of Budget-Priced Receiver Projects!

❑ Universal BFO for SWL Receivers

Got an old (or very new) AM-only shortwave radio with no CW-SSB capability? If you want to enjoy casual CW-SSB reception, this varactor-tuned 455 KHz oscillator may be built into larger receivers or else mounted in its own case and placed near your portable SWL radio. The on-board tuning control compensates for alignment variations from one receiver to another in addition to permitting fine-tuning of SSB/CW signals. Operates on 6 to 15 VDC.

T-KIT No. 1050, $9.00

Suggested Enclosure-Plus Pak, No. 1000A, $15.50

❑ Regenerative 4-Band SWL Receiver

(Kit INCLUDES drilled, painted, silkscreened aluminum front panel!)

Here it is: PROOF that the classic "first receiver" project need not be more expensive today than our favorite 1950's kits. In fact, this great little receiver beats the pants off those 3-tube radios with the big plug-in coils. Excellent for clubs, classes and family activities. Band coverage: 49 Meter SWL band, 40 Meter ham band, 31 Meter SWL band, plus exciting 12-15 MHz tuning for daytime shortwave listening, 20 Meter ham band and all those other magical shortwave sounds. The sharp-looking front panel gives the "real radio" look right away: dress up your project later with a case and knobs, and perhaps a speaker. You can enjoy the basic kit just by hooking up 9 to 12 volts DC, setting up a modest wire antenna (10 feet or more of hookup wire) and plugging in your own stereo headphones (1/8" plug). Features convenient push-button bandswitching, on-off switch, "on" LED, tuning, volume, regeneration control.

T-KIT No. 1054, $24.00

Suggested Enclosure-Plus Pak, No. 1000B, $19.50

Attention, Club Leaders! No. 1054C **T-KIT CLASS-Pak:**
Includes five 1054 Receiver Kits, Instructor's Notes, Spare-Parts Kit, $110.00.

❑ 6-to-10 Meter Receiver Converter

Get more fun and use out of that often-idle 10-Meter mobile rig or ANY ham transceiver (or receiver) with a good 10-Meter capability. Take FULL advantage of your rig's sophisticated features to enjoy low-cost monitoring of 6-Meter's fascinating propagation. Build this crystal-controlled converter at a fraction of the cost of other kits. Receive any mode available on the transceiver itself. 28-30 MHz receiving range tunes 50-52 MHz. Runs on 9-15 VDC.

T-KIT No. 1061, $17.00

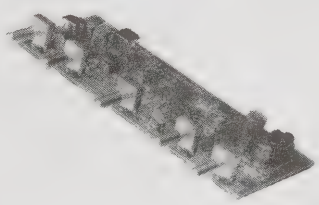
Suggested Enclosure-Plus Pak, No. 1000A, $15.50

❑ "ANY BAND" Direct-Conversion SSB/CW Receiver

This is your *best buy, by far*, in a ham band direct conversion receiver kit. It has better audio and filtering than the others, and we supply the parts and instructions to let you build it for (or change it to) ANY band of your choice. That's Right: YOU choose the Band! Many hams KNOW that there are only minor coil and capacitor differences in the simple RF input and oscillator sections of a basic direct-conversion receiver. We give you ALL parts needed to build for your choice of 160, 80, 75, 40, 30, 20, 17, 15, 12 or 10 meters! Try out your own multi-band switching ideas. Start planning a budget-priced QRP transceiver that will really WORK!

Note to Beginners: Contrary to some advertising claims, a direct-conversion receiver is very good for CW/SSB but **cannot** provide very pleasant listening for shortwave AM broadcasts (BBC, Radio Moscow, VOA, etc.) For general listening, we suggest T-KIT Model No. 1054 or No. 1253.

Model 1056 Receiver Design Features:



- ❑ Signetics NE612 mixer-oscillator
- ❑ True varactor tuning (MV209)
- ❑ Zener diode regulation
- ❑ LM358 op amp bandpass filter
- ❑ Front-panel bandpass control
- ❑ Signetics TDA2611A audio amplifier IC
- ❑ Stereo jack for economical "Walkman" headphones
- ❑ Plenty of speaker audio
- ❑ **Separate "Bandset" and s-m-o-o-th 20 KHz "Bandspread" tuning controls!**
- ❑ RF gain control
- ❑ Provision for TX sidetone injection
- ❑ Provision for receiver audio muting during transmit
- ❑ Efficient 6"WX2½"D board layout: take your favorite ham band ANYWHERE!
- ❑ Jumper provision for separate DC supply to audio IC
- ❑ Operates on 12-15 VDC

T-KIT No. 1056, $29.00

Suggested Enclosure-Plus Pak, No. 1000C, $22.50

❑ Active Antenna for Receivers

If you've been curious about what an "Active" receiving antenna can or cannot do, without paying the $40-$100 cost typical of both kit and manufactured units, you will enjoy the experience of building, learning about and using this very simple, budget-priced kit. Just for fun, we carefully tested this little T-KIT 1552 Module board next to active antennas sold by Heath, MFJ, Ramsey. Wow: you'll get the performance without the price tag! Bring ANY HF receiver to life with the 1552 and a small length of wire, or a simple whip antenna! Compact 1.75" square board can be mounted inside receiver or in its own small box. Circuit includes gain control; operates on 6 to 15 VDC.

T-KIT No. 1552, $12.00

Suggested Enclosure-Plus Pak, No. 1000A, $15.50

❑ Universal Low-Noise Broadband DC to 1 GHz RF Preamp

You KNOW that every kit company sells some sort of broadband preamp for all purposes. If you want to try a broadband, untuned RF preamp on any receiver or scanner or other instrument, THIS one is your best buy! Excellent noise figure, gain and frequency coverage *at a BUDGET PRICE!* Up to 18.5 dB gain at 100 MHz. 17 dB gain typical at 500 MHz. Supply voltage: 8-14 VDC.
T-KIT No. 1001, $9.00

❑ Utility Audio Amplifier

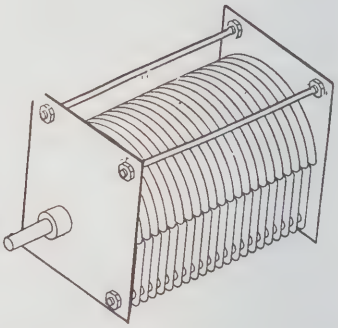
Need a quick, reliable, inexpensive audio amplifier stage for that homebrew project? This careful design *gives your project the very same audio output circuit that we use in today's TEN-TEC transceivers!* Enjoy 1.5 watts of low-distortion audio with no worry about motorboating and other unwanted oscillations. Includes optional preamp input for 10 dB gain. Important: this circuit is designed for 12-15 VDC.
T-KIT No. 1550, $10.00

❑ Microphone Speech Processor

While speech processing IS a standard feature of today's SSB transceivers, there's plenty of nice equipment at hamfest flea-markets which can benefit significantly from the addition of this proven speech processor circuit used in all of today's TEN-TEC transceivers. If there's room, build it into that older rig. Or, design it into that audio console you've been planning, or just use a neat TEN-TEC box!
T-KIT No. 1551, $12.00
Suggested Enclosure-Plus Pak, No. 1000A, $15.50

YES! You can build a . . .

High-Power Variable Capacitor

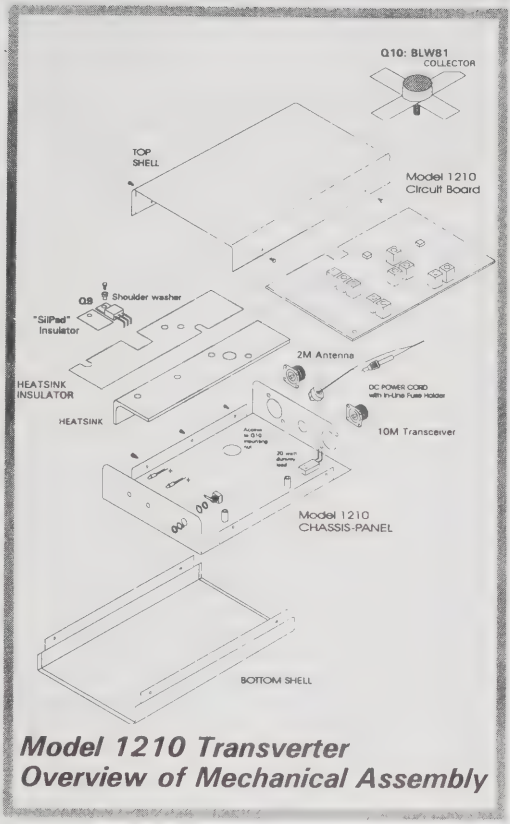


❑ 40-500 pF
❑ Rated 3.5 KV

What? Me BUILD a capacitor? Air-variable capacitors cost **$$$** these days *because of all the hand labor of putting them together.* If you'd like to spend part of an evening reliving those grand old Erector Set days, save money by assembling your own high-power variables from our top-quality factory-ware. Build the same tuning capacitors used in world-class TEN-TEC 1.5KW RF amplifiers and tuners. Great for all hi-power homebrew projects, including experimental loop antennas.
T-KIT No. 1207, $39.00 (TEN-TEC assembled No. 80-858, $58.00.)

Operate 2 Meters in Any Mode with Your 10 Meter Transceiver!

For only $139, add 2 meters to any HF transceiver. Ideal new use for those idle 10 meter mobile rigs.
Full 10 watts RF output.
ALC-controlled 10M input handles power range of 4 to 20 watts.
Solid-state T-R switching.
Engineered from scratch for optimized 10M-2M conversion performance.
Compact: 1.5"H x 5"W x 8"D.



Model 1210 Transverter Overview of Mechanical Assembly

Model 1210 Specifications:

- **Frequency Coverage:** 144-148 MHz band, typically 144-145.7 MHz, based on 28-29.7 MHz tuning range of most 10 meter transceivers. 116 MHz local oscillator.
- **Power requirement:** 12-14VDC, 100 mA. receive, 600 mA in transmit with no drive, 2.0A on transmit at 10 watts output.
- **Construction:** Black texture painted clamshell-type steel top and bottom, aluminum panel/chassis and heatsink. One 5.5"X3.75" double-sided circuit board.
- **Semiconductors:** 2 IC's, 13 transistors, 25 diodes. RF final: BLW81.

TRANSMIT:

- **RF Output:** 10 watts maximum on CW and FM, 10 watts PEP on SSB.
- **T/R Switching:** solid state, RF sensing.
- Output Power Adjustment Range: 2 to 10 watts.
- **Spurs and Harmonics:** Greater than -56 dBc at 10 watts out.
- **Standard TX Hang Time:** Approximately 1 second.
- **Input Drive:** Less than 0.5 watts input to key TX mode. 4 watts input for 10 watts output. Input drive level is ALC controlled between 4 and 20 watts. Input SWR less than 1.5:1.

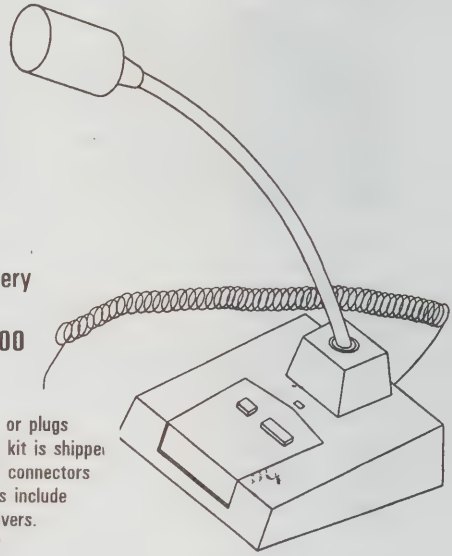
RECEIVE:

- **Noise figure:** less than 2 dB. ● **Conversion Gain:** Approximately 17 dB.
- **Image Rejection:** Greater than 60 dB. ● **Input Intercept:** -6.5 dBm typical.

T-KIT Model 1210 10M-2M Transverter KIT, $139.00.
Model 1210A Factory Assembled, $239.00

Communications Desk Microphone

If you want your station to have the same quality of desk mike expected by demanding TEN-TEC transceiver users, at a great price savings, here's your chance to build and learn all about a proven desk-style comnunications mike that will complement any HF or VHF transceiver.



T-KIT 1201 Mike Features:

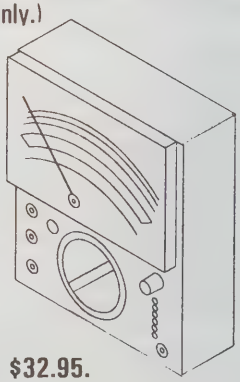
- ❑ Choice of PTT or VOX operation
- ❑ Electronic lock and release of PTT
- ❑ Sensitive op-amp preamplifier
- ❑ LED "on" indicator
- ❑ Type: Electret Condenser
- ❑ Sensitivity: -52 dBV/1 μbar
- ❑ Uses 7-14 VDC from rig or internal 9V battery

T-KIT No. 1201 Desk Microphone Kit, $59.00
TEN-TEC Model 705 (factory wired/tested), $79.95

MIKE CONNECTORS: Because various styles of connectors or plugs are used in ham and audio equipment, the 1201 microphone kit is shippe WITH shielded coil cable but less connector. Most standard connectors are stocked by RadioShack™. Current TEN-TEC microphones include 4-pin connector standard for all TEN-TEC and T-KIT transceivers.
TEN-TEC No. 35057, 4-pin microphone connector, $3.00

Economical Multitester

We found this great value in a taut band, mirrored scale VOM with handy extra features. We were so impressed with its performance that we decided to offer it for sale to our kit customers. (Not a kit: factory-assembled only.)



- ❑ 20,000 ohms/volt
- ❑ DC volts: 0.1, 0.5, 2.5, 10, 50, 250, 1000
- ❑ DC current: 50μA, 2.5, 25, 250 mA, 10A
- ❑ Resistance to 20 megohms
- ❑ AC volts: 10, 50, 250, 1000
- ❑ Audible continuity checker
- ❑ hFE transistor testing
- ❑ Built-in Battery Tester
- ❑ Rear panel pop-out stand
- ❑ 4"W X 6"H X 1.5"D

TEN-TEC Model 1130 Multitester, factory-assembled, $32.95.

Order Kits by PHONE•FAX•MAIL!

Minimum Order: $15.00 (plus shipping)

Inquiries or Information: 1-423-453-7172

8:00 AM - 5:30 PM Eastern/EDST, Monday-Friday

Credit Card Orders: 1-800-833-7373 (Orders ONLY, please!)

FAX orders or inquiries: 1-423-428-4483

☐ Check here if this is your first order of any kind DIRECT from TEN-TEC.

NAME _____ Callsign _____ *

STREET ADDRESS _____

UPS requires STREET address for delivery

CITY _____ STATE ____ ZIP _____

DAYTIME phone or fax number: ( ) _____

* Amateur Radio license required to use transmit-capable T-KIT products.

Quantity	T-KIT No.	Description	Weight	Price Each	Amount

Total Weight of order: _____ **Lbs. TOTAL:** $_____

SHIPPING per Charts: _____

Tennessee Customers must add 8.5% State tax: _____

TOTAL PAYMENT ENCLOSED / credit card authorization: _____

SHIPPING (see Weight Chart):

Total order weight:	**1-4 lbs.**	**5-10 lbs.**	**11-20 lbs.**	**Over 20 lbs:**
48 States	$6.00	$9.00	$12.00	*Please call*
AK,HI, Canada	$15.00	$19.00	$23.00	*for quote*

48 States shipped via UPS surface or U.S. Mail. AK and HI shipped 2nd Day Federal Express. Canada shipped by air mail unless UPS specifically requested.

PAYMENT BY:

☐ Check ☐ Money Order ☐ VISA ☐ Mastercard ☐ Discover

Card No. _____ Expiration Date _____

1. All payments must be in U.S. Dollars (Sorry, NO C.O.D.)

2. Kit parts are warranted for one year to be free from manufacturing defect.

3. Any T-KIT may be examined, returned complete and UNASSEMBLED in fully-reuseable condition, within 30 days of shipment date, for full credit or refund, less original shipping/handling charge. Customer pays return shipping.

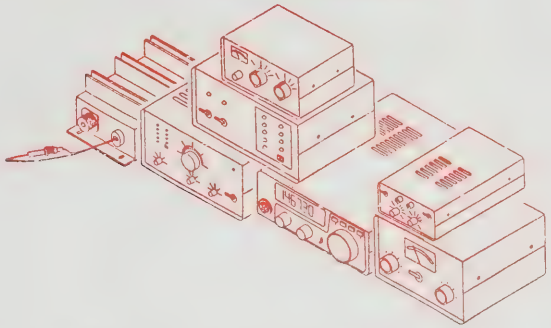
Visit our website: www.tentec.com

SHIPPING WEIGHTS

KIT	PAGE	LBS.
1000A	13	1
1000B	13	1
1000C	13	2
1001	13	1
1050	14	1
1051	12	1
1054	14	1
1054C	14	2
1056	15	1
1059	12	1
1061	14	1
1064	13	1
1130	18	2
1201	18	1
1202	8	3
1203	8	1
1207	16	2
1208	4	4
1208A	4	4
1209	5	4
1209A	5	4
1210	17	4
1210A	17	4
1220	10	5
1222	11	1
1230	9	5
1251	9	3
1252	6	3
1253	6	4
1254	3	5
1260	5	5
1320	7	4
1330	7	4
1340	7	4
1380	7	4
1550	16	1
1551	16	1
1552	15	1
1553	12	1

T-KIT
A Division of **TEN-TEC**, Inc.
1185 Dolly Parton Parkway
Sevierville, TN 37862-3710

Now, it's time for T-KITS!



While the Ham/Electronics World has been lamenting the grand old days of kit-building, the TEN-TEC team of hams, engineers and technicians has been working to bring those days back to you!

FIRST CLASS MAIL

TO:

T-KIT Catalog No.
A2000

T-KIT

A Division of TEN-TEC, Inc.

Manufacturer of AMERICA'S BEST
Amateur Radio Transceivers

NEW! Model 1254
100 kHz - 30 MHz
Receiver, page 3

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Circuit Board Projects 11-16
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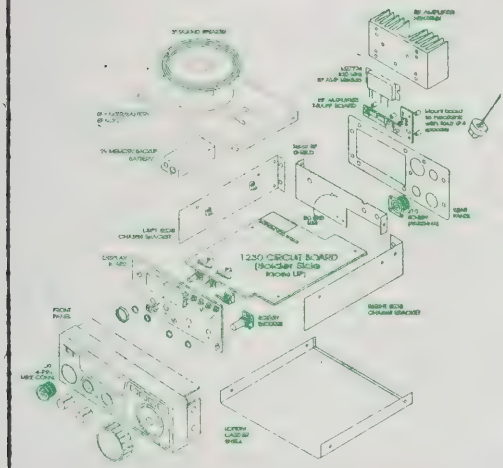
QRP CW Transceivers 7
Shortwave Receivers 3,6,14,15
Transverters, 6 meter..... 4,5
2 meter 17

T-KIT by TEN-TEC

Today's proven standard in ham radio kit building.



T-KIT

TEN-TEC, Inc.
1185 Dolly Parton Parkway, Sevierville, TN 37862-3710
Information • 1-**865**-453-7172 *(note new area code)*
Fax • 1-**865**-428-4483
Credit Card Orders Only • **1-800-833-7373** Email • sales@tentec.com

Visit our website: **www.tentec.com**

While the ham/electronics world has been lamenting the grand old days of kit-building, the TEN-TEC team of hams, engineers and technicians has been working to bring those days back to you!

TEN-TEC is the RIGHT company to bring you the very best in electronic kit-building using today's top technologies. We have 30 years of experience with the rapid changes in ham radio, and we stand today as the primary USA manufacturer of amateur transceivers . . . from the world-class Omni-VI Plus to the affordability of our take-anywhere "Scout." We manufacture enclosures, hardware, and even transformers in our own plant and we have a legendary reputation for customer support. In fact, we're the only major transceiver manufacturer which encourages you to open up your rig and fix problems yourself with our friendly help.

We've watched the kit industry with interest since our beginning. In fact, when he was president of Electro-Voice™, our chairman, Al Kahn, lent a hand and a big load of parts to some Michigan pals starting up a post-War company they named Heathkit™.

The 100 people in the TEN-TEC manufacturing plant promise you these three things absolutely ***essential*** *to any electronics kit product:*

1. **Quality engineering design**
2. **Careful packing of kit parts**
3. **Clear, informative instruction manuals**

Become our partner in this adventure of restoring the USA kit-building tradition — by following directions attentively, using that ever-proud American craftsmanship as you build!

WELCOME TO A NEW WORLD OF KIT-BUILDING
from just some of us here at TEN-TEC . . .

AL KAHN, K4FW, Chairman
Jack Burchfield, K4JU, President
Tom Salvetti, KC3NF, Vice-President, Marketing
Dan F. Onley, K4ZRA, Director, T-KIT Division

Larry Worth, WA4BSM, Production Manager, Manufacturing and T-KIT Packaging
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Mike Webber, KE4VSQ, T-KIT Engineering
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Larry Boyd, WB4ZXQ, Analog/RF Engineering
Boyd Lichlyter, KE4MCF, Analog/RF Engineering
Hardy Shelton, KA4RHX, Analog/RF Enginering
Gary Barbour, AC4DL, Digital/RF Engineering
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Garry Green, N4CJX, Technician
Chyanne Prouty, KF4HHN, QC Inspector
Don Prouty, KF4HHO, Technician
Garland Jenkins, KA4ODE, Asst. Service Mgr.
Steve McCoy, KC4UJA, Technician
Dave Dellinger, KQ4ZJ, Technician
Scott Robbins, W4PA, Amateur Radio Products Manager
Stan Brock, WDØBGS, Customer Service
Raymond Henry, AA4LL, Customer Service

TEN-TEC
. . . America's Best!

Enjoy TEN-TEC Receiver Quality with Digital Tuning for Worldwide AM-SSB-CW, from 100 kHz to 30 MHz!

T-KIT Shortwave Receiver Model 1254: only $195 and the smoothest kit-building experience you can imagine!

The grand tradition of receiver kit building is no longer confined to direct-conversion or regenerative designs! The Model 1254 combines the satisfaction of a serious kit building experience with the performance features expected in a modern HF receiver at a very competitive price. You will build a true dual-conversion superhet with a microprocessor-controlled frequency synthesizer. Building this receiver yourself gives you the assurance that you can maintain it in perfect working order.

BUILDING SKILL LEVEL: Intermediate ● BUILDING TIME: 20 to 25 hours

- **Frequency coverage:** 100 kHz to 30 MHz ● **Modes:** AM, SSB/CW
- **Main Tuning:** Normal or Fast tuning (2.5 kHz SSB, 5.0 kHz AM, or 100 kHz steps for either mode)
- **"Clarifier" Control:** for ±1.5 kHz SSB/CW fine tuning between 2.5 kHz steps.
- **Front panel controls:** On/off switch, Tuning, Volume, Clarifier, Mode Select, Memory Write (MW), VFO/Memory tuning select (V/M), Tuning Rate Select (SPEED)
- **Memories:** 15 programmable memories
- **Circuit:** Synthesized 45-75 MHz local oscillator ● 45 MHz first I-F, 455 kHz second I-F
- **Sensitivity:** AM mode: 2.5 μV for 10 dB SNR at 30% modulation
  SSB/CW mode: 0.5 μV for 10 dB SNR ● **Selectivity:** 4 kHz @ -6 dB
- **Frequency/Memory Display:** 6-digit green LED with mode indicators
- **Power supply:** 12-15 VDC, 250 mA current consumption with no signal present;
  15VDC @800 mA wall transformer supply *included* with kit.
- **Antenna connector:** 50 ohm input, RCA-style phono jack
- **Audio:** 1.5 watts audio output to internal speaker, plus 1/8" stereo phone jack for standard personal headphones or direct feed to 4-8 ohm external speaker, data interface or both.
- **Semiconductors:** 10 IC's, 26 transistors, 16 diodes
- **Compact Size:** 2.25" x 6.5" x 6.5" (HWD)
- **Construction:** Steel clamshell case, aluminum chassis, custom-molded front panel.

EASY ALIGNMENT!

Yesteryear's serious superhet receivers involved many dozens of alignment points, usually requiring professional service equipment, often scaring away the casual hobbyist. To "align" your state-of-the-art Model 1254, you need only a VOM and your ear! During kit construction, we provide **Progress Tests** for each of the 6 Assembly Phases. The receiver generates its own built-in 45 MHz test signal.

T-KIT Model 1254 Shortwave Receiver KIT: $195.00
(Includes all parts, DC power supply, Kit Manual, SWL Guide and Log booklet)

Let's Get Together and REPOSSESS 6 Meters!

How long can FOUR WHOLE MEGAHERTZ of precious semi-HF VHF spectrum just sit there for us hams if so few of us have gear to even try out this fascinating 6 Meter band? The T-KIT 1208 Transverter lets new Technicians and oldtimers alike repossess 6 Meters at a VERY nice price!

SSB-CW-FM **6-Meter Transverter**

Add the excitement of the 50 MHz amateur band so easily to ANY modern ham transceiver, including all those 20-Meter-only QRP rigs. A transverter lets you transmit as well as receive on 6 Meters, using the precision digital tuning, available modes, memories and other features of your HF transceiver. It's simple: 14.000 MHz on your display or dial is 50.000 MHz. To operate SSB on 50.200 MHz, simply switch the 1208 to 6 Meters, tune to 14.200, keep transceiver RF output under 5 watts, and just go for it! The 8 Watts RF output is generous power during good band openings and for local communications and repeaters.

Features:

- ❑ Use with any transceiver capable of 3-5 watts on 20 meters
- ❑ Extremely simple hookup and operation
- ❑ Low-noise 50-54 MHz receiving input
- ❑ Easy front-panel switching between HF and 6M antennas
- ❑ Fast, silent RF-sensing PIN diode T-R switching for QSK and data communication

Specifications and Operating Requirements: 12-15VDC at 3.0 amperes external DC power requirement • RF output at 51 MHz: 8 watts typical • standard 20M transceiver required for basic 50.000-50.350 MHz Beacon/CW/SSB operation • FM operation requires FM transmit/receive capability of a general coverage transceiver capable of 14-16 MHz operation, with repeater offsets being a function of the transceiver's VFO memory system • Receive 50-54 MHz; transmit 50-52 MHz (transmitting above 52 MHz is not recommended) • the 14 MHz transceiver RF output MUST be attenuated to 5 watts or less.

T-KIT No. 1208, Six-Meter Transverter Kit, $95.00
No. 1208A, Assembled/Tested 6M Transverter, $159.00

JUST WANT TO LISTEN IN . . .

on 6 Meters on a budget? Try a fine little 6-Meter Receive Converter with any 10 Meter receiver or transceiver by building T-KIT Module Board No. 1061 for only $17.00. 28-30 MHz receiver coverage tunes 50-52 MHz. SEE **Page 14.**

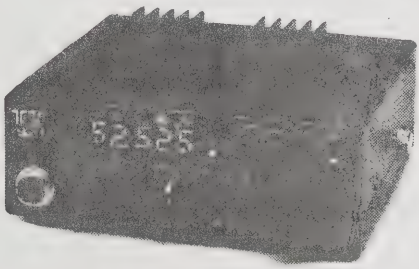
More Ways to explore 6 Meters

T-KIT Model 1209 Transverter: 8 watts RF output on 6 meters from your 2 meter rig or HT for only $95!

Newly-licensed hams: explore your operating privileges beyond 2 Meters VERY economically! Operate 50-54 MHz on any mode covered by your 144-148 MHz rig or HT. With the same general features and specifications as our popular 1208 6 Meter Transverter (see page 4), the Model 1209 was designed for those regions where 6M FM repeaters take the load off the busy 2M systems. And you may find yourself making cross-country simplex QSO's during those exciting 6M band openings.

Just think: only $290 gives you BOTH 2M and 6M if you build and use the 1220 Transceiver and 1209 Transverter! (See page 10)

T-Kit Model No. 1209 6 meter Transverter KIT, $95.00
Model 1209A, factory assembled, $159.00



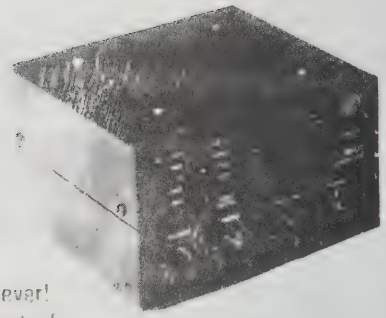
T-KIT Model 1260 6 Meter FM TRANSCEIVER for only $195!

- **15 programmable memories**
- **ready for 6M's varying transmit offset schemes**
- **microprocessor-controlled**
- **complete with microphone, internal speaker and mobile bracket**

Read about the Model 1220 2M transceiver (pages 10-11) and imagine the same great-looking rig ready for easy and fun 6M FM repeater or simplex action, no matter what kind of transmit offset scheme is employed! FCC regulations currently prohibit the sale of an add-on amplifier, but our many happy transverter owners can tell you that a few watts on 6M is a blast!

T-KIT Model 1260 5 Watt 6 meter Transceiver KIT, $195.00.

9-Band Shortwave Receiver



The classic "first radio kit" is back better than ever! We've combined the very same audio output circuit of TEN-TEC transceivers with a modern FET design for classic regenerative SWL receiving plus one-button electronic bandswitching. The result is an easy to build shortwave radio that's fun and interesting for the whole family. No alignment required. Simply install all parts as directed, put together the high-quality mechanical parts, and start enjoying the magic of shortwave radio. Explore 9 smooth-tuning SWL and ham bands from 1.8 to 22 MHz at the push of a ⏏ button! Receives AM, SSB, CW and all those other magical shortwave sounds.

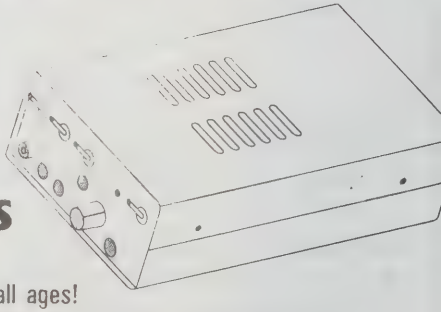
FEATURES: Front-panel RF gain, Volume, Regeneration, Tuning and Fine-Tuning controls ● generous audio from Signetics TDA2611A to built-in speaker or stereo phone jack ● Electronic switching of 9 tuning ranges ● rugged, rounded-corner shell steel enclosure ● simple, clear linear logging scale for large tuning knob ● requires 8 alkaline C cells or external 12VDC.

KIT No. 1253, $59.00

On a tight budget with a club of eager radio builders? Our 4-Band Model 1054 Module Board Kit has comparable features for only $24! See page 14.

Listen to the Mysterious Sounds of ENERGY!

Hi-Sensitivity Audio Amplifier with Experiments



A wonderful project kit for experimenters of all ages!

Build a rugged, versatile, portable utility amplifier (for which you'll find dozens of practical uses over the years). Then, begin to explore the fascinating world of the unique sounds made by all kinds of energy — from lightning whistlers on the other side of the world to the stress noise of a bending paperclip. Listen to radar, to light waves, to your computer. Listen to nearby radio signals on any frequency, any mode. In addition to the kit assembly manual, you get a fascinating project booklet based on experiments by USAF Engineer Calvin R. Graf as your guide to adventures with the sounds of Energy. Amplifier features hi and low Z inputs, switchable preamp, 1.5W output. Requires 8 "AA" batteries or external 12-15 VDC.

NOTE: The kit includes accessories for many of the energy listening experiments. You will need 1x2" wood (furring strips) and wire to build the 4' loop antenna explained in the project booklet.

T-KIT No. 1252, $44.00

Take your favorite CW band anywhere for only $95!

TEN-TEC began in 1968 with the release of very inexpensive "QRP" transceivers. We thought it would be fun to revisit those roots. We explored today's RF technology and components to see just how inexpensive, compact and simple a ***quality*** QRP kit rig could be. The low price and great receiver design make these QSK VFO-controlled transceivers a smart choice for those times and moods when you want to try out a few watts of RF output. Get on the air from the beach, or a mountaintop, or your office or dorm room!

A New Family of QRP CW Transceivers!

T-KIT Model 1320 for **20 Meters**, $95.00
T-KIT Model 1330 for **30 Meters**, $95.00
T-KIT Model 1340 for **40 Meters**, $95.00
T-KIT Model 1380 for **80 Meters**, $95.00

Frequency Coverage: VFO tuning of any 50 KHz segment of CW subband. Tuning range is selected during winding of one toroid in the VFO circuit.
Frequency Control: varactor tuned oscillator with potentiometer control. Temperature compensated LC components stabilize VFO.
RIT (receive incremental tuning): ±1.5 KHz.
Antenna: 50 ohm unbalanced, SO-239 connector.
Power requirement: 12-14VDC, 35 mA. receive (no signal), 80 mA receive (S-9 signal), 800 mA on transmit.
Construction: Black texture painted clamshell-type steel top and bottom, aluminum chassis, subpanel and heatsink. One 3.5"X5" double-sided circuit board.
Board-mounted Components: 216 including 4 IC's, 19 transistors, 13 diodes.
Front Panel Controls: main tuning, RIT, volume, DC on-off toggle.
Connectors: front panel 1/4" stereo phone jack; rear panel SO-239 for antenna, 3 RCA jacks for key, DC input, accessory DC output.
Dimensions: HWD 2.75"x6"x6". **Weight:** 2.25 lbs./1.02 kg.

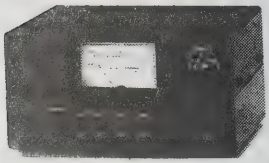
TRANSMITTER:

- **RF Output:** 3 watts typical, no external adjustment ● **T/R Switching:** solid state, full break-in
- **CW offset and sidetone:** Adjustable 400-1000 Hz sidetone automatically tracks offset frequency. Sinewave sidetone has internal level adjustment.

RECEIVER:

- **Type:** single conversion superhet, JFET mixer ● **Sensitivity:** .25 μV typical for 10 dB S/N
- **Selectivity:** 4-pole crystal ladder filter (1 KHz nominal bandwidth)
- **AGC:** audio derived ● **IF frequency:** 11 MHz on 80 and 40 meter models; 14.32 MHz on 30 meter model; 6.14 MHz on 20 meter model.
- **Audio:** 300 mW @ 4 ohms, built-in 3" speaker

20/200 Watt **SWR Bridge & RF Wattmeter** for BOTH 1.8-30 MHz AND 144-148 MHz!



Build this top-quality station accessory that you'll use for a long, long time. Features easy-to-read meter, front panel switching of 20 or 200 watt ranges, HF or 2-Meters, sensitivity control, four SO-239 antenna and transmitter connectors, all housed in a rugged steel enclosure less likely to bounce at the mercy of RG-8 coax! Range: 1.8 to 30 MHz *plus* 2 Meters! Separate HF and VHF connectors let you leave the unit in-line with BOTH rigs. Convenient toggle switching between HF and VHF. This is your USE-ANYWHERE RF Power/SWR meter system!

T-KIT Model 1202 SWR Bridge Kit, $49.00

No. 1202A, wired and tested, $74.00

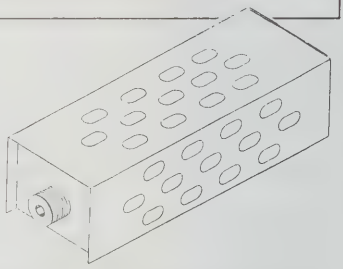
TEN-TEC . . . *America's Best!*

You have the common sense to know why TEN-TEC doesn't build into the cost of our radios the cost of giving away hats 'n stuff at hamfests. But, we're proud of the many requests we get for TEN-TEC caps, mugs, or other symbols of the made-in-USA pride that you share with the 100 folks at TEN-TEC. So, if you'd like our sharp-looking, top-quality *embroidered* all-weather cap (gray, with black/red design), it's yours for a few % over our cost! Thanks for joining the TEN-TEC team!

TEN-TEC embroidered cap, adjustable band, $10.00.

RF Dummy Load

50-Ohm, 300 Watts



"I know I SHOULD be using a dummy load for this test. Will this giant surplus resistor work? What's the impedance of this big old light bulb?"

YES, a dummy load is the least exciting of all radio tools. But, there are those times when it's the right tool for the job. Your complex transceiver suddenly acts like a QRP rig: is it the rig, the tuner or the antenna? Loading the rig directly into the 1203 Dummy Load will report the basic health of your transmitter section. Save $$ by building this easy kit yourself. With many common-sense uses, this is the boring accessory you'll really appreciate whenever you start to wonder what's going on with ANY transmitter setup. Good for HF and VHF. C'mon: get one!

T-KIT No. 1203, $24.00, TEN-TEC No. 239, factory-assembled, $27.95

2 Meters Getting Crowded? Discover 220 MHz Action!

T-KIT Model 1230 220 MHz FM Transceiver

Engineered specifically for the 222-225 MHz band, using integrated 220 MHz RF power module for simplified construction and alignment. Front-panel switching of 4-5 watts or 20 watts RF output. Shop around: the Model 1220 is the lowest-priced 220 MHz rig on the market with the features you need and expect. Microprocessor-controlled, 15 memories, tunes 221.890 - 225.200 MHz in 10 KHz steps, plus Memory Scan. General operating features similar to Models 1220 and 1260.

See next page for more details and specs on T-KIT VHF FM Transceivers.

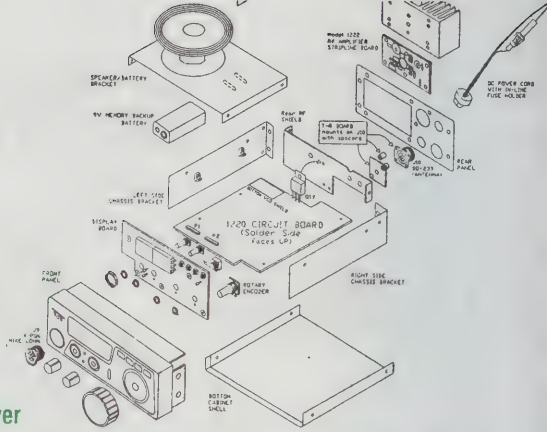
T-KIT Model 1230 20 Watt FM Transceiver Kit, $295.00
Includes microphone and mobile mounting bracket.

Compact RF Ground Counterpoise

At a fraction of the cost and size of other "artificial ground" gadgets, the T-KIT 1251 helps solve those annoying RFI/TVI and "hot chassis" problems caused by a lack of proper RF ground. Ideal for condo and travel situations where PVC plumbing makes classic waterpipe grounding schemes impossible, or if a good ground is too far away from the station. While NOT a substitute for a vertical's radial system or for the basic safety grounding required for all installations, it does provide a "tuned counterpoise" to satisfy the transmitter's need for a correct RF ground path.

T-KIT Model No. 1251, $49.00.

Build your own 15-Memory 2-Meter FM Transceiver for only $195!

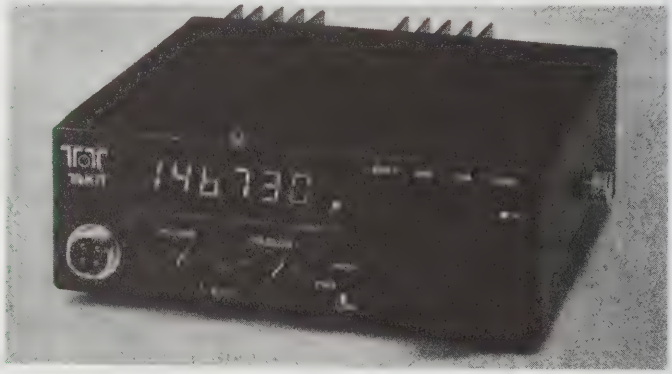


The Model 1220 FM/Data Transceiver shows just how serious T-KIT is about filling the big void in ham radio kit-building. Why pay hundreds more? You do NOT have to rely on imports for a 2-meter FM transceiver with the modern features which today's hams take for granted. And you won't have to settle for the stripped-down performance of other VHF kit transceivers. You'll learn from building it how to take care of it yourself. Priced like a second rig, good enough to be your only rig!

T-KIT Model 1220 Transceiver Features:

- ❑ Advanced microprocessor-controlled design
- ❑ Front-panel knob tuning of 143.500-148.500 MHz in 5 KHz **(or 2.5 KHz) steps**
- ❑ **15 Memories** store frequencies with repeater offsets **AND subaudible tones!**
- ❑ Store up to FIVE non-standard TX offsets (CAP, MARS, etc.)
- ❑ Bright 6-digit LED display resolves to 5 KHz channel tuning **steps**
- ❑ LED indicators for TX Offsets, Simplex, RX Busy, TX On-Air, **CTCSS tone on**
- ❑ Built-in speaker PLUS external speaker jack
- ❑ Optimized, standardized packet circuitry, standard DIN connector
- ❑ **Hand Microphone and Mobile Mount . . . BOTH INCLUDED!**
- ❑ Build it now for 5 Watts or 30 Watts, or upgrade to 30 Watts later

- ❑ Contemporary molded front panel and steel case are standard, **not extra!**
- ❑ Instantaneous, silent PIN diode T-R switching
- ❑ Full CTCSS subaudible TX tone set **BUILT-IN**, microprocessor-controlled

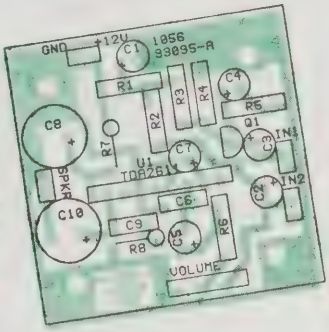


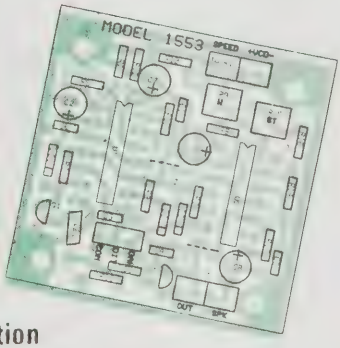
Model 1220 Typical Specifications: Sensitivity .2 μV for 12 dB SINAD • Deviation ± 5 KHz • Dynamic range: 70 dB (2 tone, 3rd order IMD @ 20 KHz from 146 MHz) • Adjacent channel rejection: 70 dB (@ 20 KHz from 146 MHz).

T-KIT Model No. 1220 Transceiver Kit, 5 Watts RF Output, $195.00
No. 1222 30 Watt RF amplifier module kit for Model 1220, $64.00

For Creative Kit-Builders . . .

T-KIT MODULE BOARDS





As T-KIT continues the Tradition
of Heathkit, Knight, WRL, Layafette and those other grand kits
complete with all hardware and enclosure
there still is the other tradition of
simpler kits with PC-board, primary parts and instructions only,
designed for those who prefer to find their own kit-finishing hardware.
That's why we bring you T-KIT MODULE BOARDS,
the very best in "little kits" for careful budgets!

These "smaller" but carefully-engineered T-KIT boards
are for hams and experimenters who use their own hardware and ingenuity to custom-finish a project. You get the circuit board with all needed I/O pads, all board-mounted parts, a well-engineered circuit and the same high-quality step-by-step instruction manual that is the hallmark of all T-KITS. Finish the job with your own switches, connectors and enclosure, or get a great head-start with a T-KIT *Enclosure-PLUS* Hardware Pak featuring TEN-TEC's easy-to-use blank aluminum boxes, plus a useful assortment of finishing hardware and components.

See Pages 12-16:
T-KIT MODULE BOARDS . . . the very BEST in "Little Kits"!

❑ Transmatch Tuning Bridge

Have you ever wondered what good one of those $60-100 "R-X Noise Bridges" could do for YOUR station setup? Are you baffled by your antenna tuner or "transmatch"? The 1051 is easy to build and super-easy to use. No "R-X" controls, calibration or calculations needed. Just connect it between your rig and antenna tuner, set receiver to desired operating frequency, and adjust the antenna tuner until the distinctive *modulated pulses* (NOT just straight "noise"!) drop to an easily-recognized "null" indicating that the tuner offers a 50-ohm match to your transceiver -- with NO on-the-air nervous experimenting with the tuner controls!

T-KIT No. 1051, $17.00

Suggested Enclosure-Plus Pak, No. 1000A, $15.50

❑ Foxhunt "Beep-Beep" Transmitter (for FM Broadcast Band)

Here's a great gadget at a great price for clubs, classes, scout troops and packs, camps and family fun! Tune it to any quiet part of the 88-108 MHz FM band per FCC Part 15 rules, noticing its distinctive "beep-beep" modulation, and let the kids use their own FM portable radios to discover the basics of direction-finding. Hide it indoors on rainy days! Includes board-mounted on-off switch and 9V battery snap. Use several to demonstrate triangulation.

T-KIT No. 1059, $12.00.

❑ Budget Electronic Keyer

A classic circuit and a nice price make this a great project for beginners or for building into extra rigs. Includes speed control, weight control (rarely offered in "simple" CMOS circuits) and sidetone pitch control. A lot of keyer for the price, it features self-completing dits and dahs for standard single-lever keyer paddles. While not designed for iambic operation, the price and reliability make the 1553 a very nice introduction to electronic CW keying.

T-KIT No. 1553, $12.00

Suggested Enclosure-Plus Pak, No. 1000A, $15.50

(Also may be mounted inside TEN-TEC Keyer Paddle, Model 607, $39.00.)

T-KIT, a division of TEN-TEC, Inc.

1185 Dolly Parton Parkway • Sevierville, TN 37862 •

T-KIT Enclosure-*PLUS* Hardware Paks

With three sizes to fit all T-KIT Module Boards, these nifty Enclosure-PLUS Hardware Paks give you real choices for dressing up your small kit projects:

- ❑ Dig through and make good use of your own parts collection
- ❑ Shop at Radio Shack, local distributor or next hamfest
- ❑ Enjoy the practicality of a T-KIT **Enclosure-*PLUS*** Hardware Pak

ALL Enclosure-PLUS Hardware Paks include: TEN-TEC TP-series aluminum box suitable for your project, mechanical hardware, plus helpful toggle switches, knobs, etc. You may get more than needed for the one project: add the extra goodies to your parts drawers for your next T-KIT MODULE BOARD project!

Connectors: Since there are so many **different** hookup methods useable for RF, DC, audio, and other connections, we must leave it up to you (or your Radio Shack store, ham buddy or hamfest) to choose what's handiest for rear-panel hookups.

THREE Convenient T-KIT Enclosure-PLUS Hardware Pak sizes:

- ❑ T-KIT No. 1000A (standard), $15.50
  [TP19 box (2X4¾X4"), DPDT toggle, wire/mini-coax pak, knob, misc. hardware]
- ❑ T-KIT No. 1000B (medium), $19.50 [tops in value and general usefulness]
  [TP41 box (2¼X5½X4¼"), DPDT & SPDT, 3 knobs, wire/coax pak, hardware]
- ❑ T-KIT No. 1000C (deluxe), $22.50 [for 1056 receiver, similar projects.]
  [TP45 box (2¾X6½X5½"), SPDT, wire/coax/hardware, 5 knobs, 3" speaker]

❑ "Smart Squelch" Band Opening Alert

Also known as the DXer's "Integrating Squelch," this great circuit liberates your family from hiss, whines and other noises when your receiver is tuned for those unpredictable openings on any HF or VHF band that usually seems DEAD. This "integrating" squelch responds to the cumulative effect of several seconds of weak signal rather than to isolated noise bursts. Connect between rig and external speaker; no receiver modification required. You supply creative 12VDC alarm devices (piezo, chime, strobe light, etc.) Also may be used to add conventional squelch feature to older receivers, any mode. (Strong signals break squelch quickly.)

T-KIT No. 1064, $19.00

Suggested Enclosure-Plus Pak, No. 1000A, $15.50

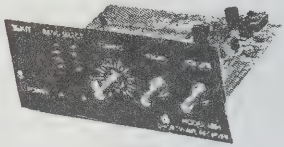
A New World of Budget-Priced Receiver Projects!

❑ Universal BFO for SWL Receivers

Got an old (or very new) AM-only shortwave radio with no CW-SSB capability? If you want to enjoy casual CW-SSB reception, this varactor-tuned 455 KHz oscillator may be built into larger receivers or else mounted in its own case and placed near your portable SWL radio. The on-board tuning control compensates for alignment variations from one receiver to another in addition to permitting fine-tuning of SSB/CW signals. Operates on 6 to 15 VDC.

T-KIT No. 1050, $9.00

Suggested Enclosure-Plus Pak, No. 1000A, $15.50



❑ Regenerative 4-Band SWL Receiver

(Kit INCLUDES drilled, painted, silkscreened aluminum front panel!)

Here it is: PROOF that the classic "first receiver" project need not be more expensive today than our favorite 1950's kits. In fact, this great little receiver beats the pants off those 3-tube radios with the big plug-in coils. Excellent for clubs, classes and family activities. Band coverage: 49 Meter SWL band, 40 Meter ham band, 31 Meter SWL band, plus exciting 12-15 MHz tuning for daytime shortwave listening, 20 Meter ham band and all those other magical shortwave sounds. The sharp-looking front panel gives the "real radio" look right away: dress up your project later with a case and knobs, and perhaps a speaker. You can enjoy the basic kit just by hooking up 9 to 12 volts DC, setting up a modest wire antenna (10 feet or more of hookup wire) and plugging in your own stereo headphones (1/8" plug). Features convenient push-button bandswitching, on-off switch, "on" LED, tuning, volume, regeneration control.

T-KIT No. 1054, $24.00

Suggested Enclosure-Plus Pak, No. 1000B, $19.50

Attention, Club Leaders! No. 1054C **T-KIT CLASS-Pak:**
Includes five 1054 Receiver Kits, Instructor's Notes, Spare-Parts Kit, $110.00.

❑ 6-to-10 Meter Receiver Converter

Get more fun and use out of that often-idle 10-Meter mobile rig or ANY ham transceiver (or receiver) with a good 10-Meter capability. Take FULL advantage of your rig's sophisticated features to enjoy low-cost monitoring of 6-Meter's fascinating propagation. Build this crystal-controlled converter at a fraction of the cost of other kits. Receive any mode available on the transceiver itself. 28-30 MHz receiving range tunes 50-52 MHz. Runs on 9-15 VDC.

T-KIT No. 1061, $17.00

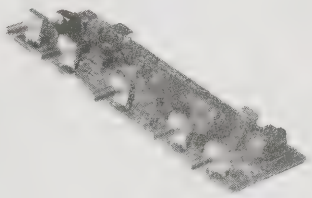
Suggested Enclosure-Plus Pak, No. 1000A, $15.50

❑ "ANY BAND" Direct-Conversion SSB/CW Receiver

This is your *best buy, by far*, in a ham band direct conversion receiver kit. It has better audio and filtering than the others, and we supply the parts and instructions to let you build it for (or change it to) ANY band of your choice. That's Right: YOU choose the Band! Many hams KNOW that there are only minor coil and capacitor differences in the simple RF input and oscillator sections of a basic direct-conversion receiver. We give you ALL parts needed to build for your choice of 160, 80, 75, 40, 30, 20, 17, 15, 12 or 10 meters! Try out your own multi-band switching ideas. Start planning a budget-priced QRP transceiver that will really WORK!

Note to Beginners: Contrary to some advertising claims, a direct-conversion receiver is very good for CW/SSB but **cannot** provide very pleasant listening for shortwave AM broadcasts (BBC, Radio Moscow, VOA, etc.) For general listening, we suggest T-KIT Model No. 1054 or No. 1253.

Model 1056 Receiver Design Features:



- ❑ Signetics NE612 mixer-oscillator
- ❑ True varactor tuning (MV209)
- ❑ Zener diode regulation
- ❑ LM358 op amp bandpass filter
- ❑ Front-panel bandpass control
- ❑ Signetics TDA2611A audio amplifier IC
- ❑ Stereo jack for economical "Walkman" headphones
- ❑ Plenty of speaker audio
- ❑ **Separate "Bandset" and s-m-o-o-th 20 KHz "Bandspread" tuning controls!**
- ❑ RF gain control
- ❑ Provision for TX sidetone injection
- ❑ Provision for receiver audio muting during transmit
- ❑ Efficient 6"W X 2½"D board layout, take your favorite ham band ANYWHERE!
- ❑ Jumper provision for separate DC supply to audio IC
- ❑ Operates on 12-15 VDC

T-KIT No. 1056, $29.00

Suggested Enclosure-Plus Pak, No. 1000C, $22.50

❑ Active Antenna for Receivers

If you've been curious about what an "Active" receiving antenna can or cannot do, without paying the $40-$100 cost typical of both kit and manufactured units, you will enjoy the experience of building, learning about and using this very simple, budget-priced kit. Just for fun, we carefully tested this little T-KIT 1552 Module board next to active antennas sold by Heath, MFJ, Ramsey. Wow: you'll get the performance without the price tag! Bring ANY HF receiver to life with the 1552 and a small length of wire, or a simple whip antenna! Compact 1.75" square board can be mounted inside receiver or in its own small box. Circuit includes gain control; operates on 6 to 15 VDC.

T-KIT No. 1552, $12.00

Suggested Enclosure-Plus Pak, No. 1000A, $15.50

❑ Universal Low-Noise Broadband DC to 1 GHz RF Preamp

You KNOW that every kit company sells some sort of broadband preamp for all purposes. If you want to try a broadband, untuned RF preamp on any receiver or scanner or other instrument, THIS one is your best buy! Excellent noise figure, gain and frequency coverage *at a BUDGET PRICE!* Up to 18.5 dB gain at 100 MHz. 17 dB gain typical at 500 MHz. Supply voltage: 8-14 VDC.
T-KIT No. 1001, $9.00

❑ Utility Audio Amplifier

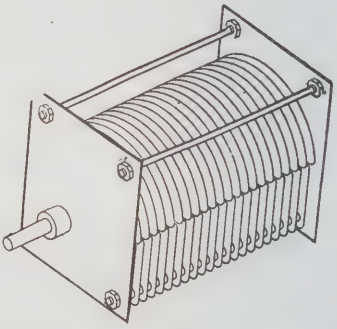
Need a quick, reliable, inexpensive audio amplifier stage for that homebrew project? This careful design *gives your project the very same audio output circuit that we use in today's TEN-TEC transceivers!* Enjoy 1.5 watts of low-distortion audio with no worry about motorboating and other unwanted oscillations. Includes optional preamp input for 10 dB gain. Important: this circuit is designed for 12-15 VDC.
T-KIT No. 1550, $10.00

❑ Microphone Speech Processor

While speech processing IS a standard feature of today's SSB transceivers, there's plenty of nice equipment at hamfest flea-markets which can benefit significantly from the addition of this proven speech processor circuit used in all of today's TEN-TEC transceivers. If there's room, build it into that older rig. Or, design it into that audio console you've been planning, or just use a neat TEN-TEC box!
T-KIT No. 1551, $12.00
Suggested Enclosure-Plus Pak, No. 1000A, $15.50

YES! You can build a . . .

High-Power Variable Capacitor

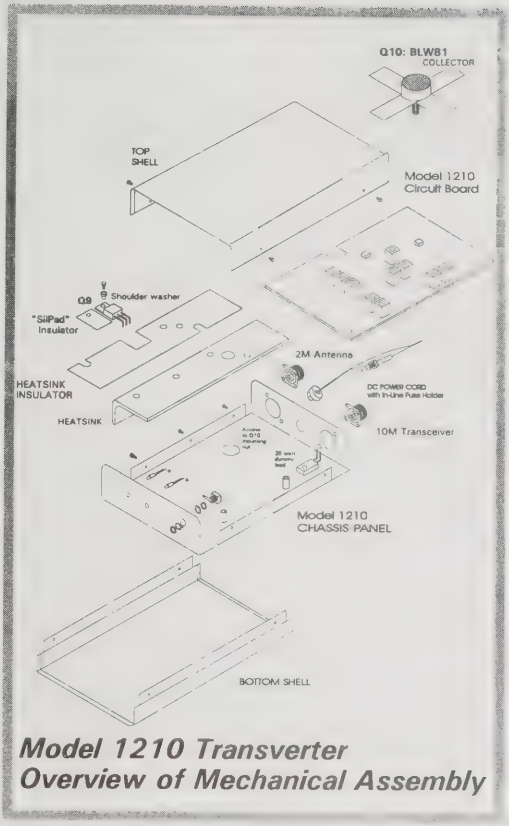


❑ 40-500 pF
❑ Rated 3.5 KV

What? Me BUILD a capacitor? Air-variable capacitors cost $$$ these days ***because of all the hand labor of putting them together.*** If you'd like to spend part of an evening reliving those grand old Erector Set days, save money by assembling your own high-power variables from our top-quality factory-ware. Build the same tuning capacitors used in world-class TEN-TEC 1.5KW RF amplifiers and tuners. Great for all hi-power homebrew projects, including experimental loop antennas.
T-KIT No. 1207, $39.00 (TEN-TEC assembled No. 80-858, $58.00.)

Operate 2 Meters in Any Mode with Your 10 Meter Transceiver!

For only $139, add 2 meters to any HF transceiver. Ideal new use for those idle 10 meter mobile rigs.
Full 10 watts RF output.
ALC-controlled 10M input handles power range of 4 to 20 watts.
Solid-state T-R switching.
Engineered from scratch for optimized 10M-2M conversion performance.
Compact: 1.5"H x 5"W x 8"D.



Model 1210 Transverter Overview of Mechanical Assembly

Model 1210 Specifications:

- **Frequency Coverage:** 144-148 MHz band, typically 144-145.7 MHz, based on 28-29.7 MHz tuning range of most 10 meter transceivers. 116 MHz local oscillator.
- **Power requirement:** 12-14VDC, 100 mA. receive, 600 mA in transmit with no drive, 2.0A on transmit at 10 watts output.
- **Construction:** Black texture painted clamshell-type steel top and bottom, aluminum panel/chassis and heatsink. One 5.5"X3.75" double-sided circuit board.
- **Semiconductors:** 2 IC's, 13 transistors, 25 diodes. RF final: BLW81.

TRANSMIT:

- **RF Output:** 10 watts maximum on CW and FM, 10 watts PEP on SSB.
- **T/R Switching:** solid state, RF sensing.
- Output Power Adjustment Range: 2 to 10 watts.
- **Spurs and Harmonics:** Greater than -56 dBc at 10 watts out.
- **Standard TX Hang Time:** Approximately 1 second.
- **Input Drive:** Less than 0.5 watts input to key TX mode. 4 watts input for 10 watts output. Input drive level is ALC controlled between 4 and 20 watts. Input SWR less than 1.5:1.

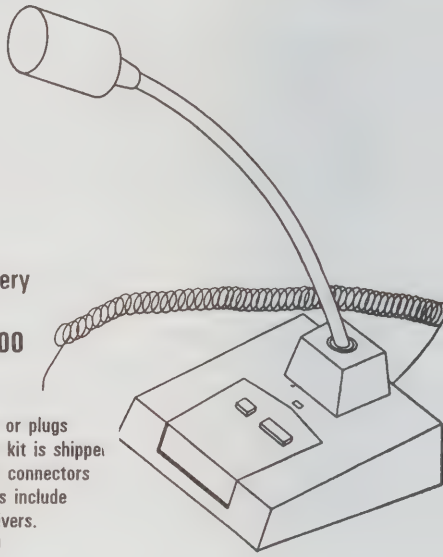
RECEIVE:

- **Noise figure:** less than 2 dB. ● **Conversion Gain:** Approximately 17 dB.
- **Image Rejection:** Greater than 60 dB. ● **Input Intercept:** -6.5 dBm typical.

T-KIT Model 1210 10M-2M Transverter KIT, $139.00.
Model 1210A Factory Assembled, $239.00

Communications Desk Microphone

If you want your station to have the same quality of desk mike expected by demanding TEN-TEC transceiver users, at a great price savings, here's your chance to build and learn all about a proven desk-style comunications mike that will complement any HF or VHF transceiver.



T-KIT 1201 Mike Features:

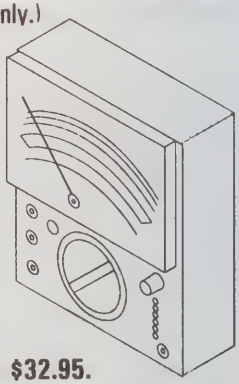
- ❑ Choice of PTT or VOX operation
- ❑ Electronic lock and release of PTT
- ❑ Sensitive op-amp preamplifier
- ❑ LED "on" indicator
- ❑ Type: Electret Condenser
- ❑ Sensitivity: -52 dBV/1 μbar
- ❑ Uses 7-14 VDC from rig or internal 9V battery

T-KIT No. 1201 Desk Microphone Kit, $59.00
TEN-TEC Model 705 (factory wired/tested), $79.95

MIKE CONNECTORS: Because various styles of connectors or plugs are used in ham and audio equipment, the 1201 microphone kit is shippe WITH shielded coil cable but less connector. Most standard connectors are stocked by RadioShack™. Current TEN-TEC microphones include 4-pin connector standard for all TEN-TEC and T-KIT transceivers.
TEN-TEC No. 35057, 4-pin microphone connector, $3.00

Economical Multitester

We found this great value in a taut band, mirrored scale VOM with handy extra features. We were so impressed with its performance that we decided to offer it for sale to our kit customers. (Not a kit: factory-assembled only.)



- ❑ 20,000 ohms/volt
- ❑ DC volts: 0.1, 0.5, 2.5, 10, 50, 250, 1000
- ❑ DC current: 50μA, 2.5, 25, 250 mA, 10A
- ❑ Resistance to 20 megohms
- ❑ AC volts: 10, 50, 250, 1000
- ❑ Audible continuity checker
- ❑ hFE transistor testing
- ❑ Built-in Battery Tester
- ❑ Rear panel pop-out stand
- ❑ 4"W X 6"H X 1.5"D

TEN-TEC Model 1130 Multitester, factory-assembled, $32.95.

Order Kits by PHONE • FAX • MAIL!

Minimum Order: $15.00 (plus shipping)

Inquiries or Information: 1-865-453-7172

8:00 AM - 5:30 PM Eastern/EDT, Monday-Friday

Credit Card Orders: 1-800-833-7373 (Orders ONLY, please!)

FAX orders or inquiries: 1-865-428-4483

☐ Check here if this is your first order of any kind DIRECT from TEN-TEC.

NAME _____ Callsign _____ *

STREET ADDRESS _____

UPS requires STREET address for delivery

CITY _____ STATE ____ ZIP _____

DAYTIME phone or fax number: ( ) _____

* Amateur Radio license required to use transmit-capable T-KIT products.

Quantity	T-KIT No.	Description	Weight	Price Each	Amount

Total Weight of order: _____ **Lbs. TOTAL:** $ _____

SHIPPING per Charts: _____

Tennessee Customers must add 8.5% State tax: _____

TOTAL PAYMENT ENCLOSED / credit card authorization: _____

SHIPPING (see Weight Chart):

Total order weight:	1-4 lbs.	5-10 lbs.	11-20 lbs.	Over 20 lbs:
48 States	$6.00	$9.00	$12.00	*Please call*
AK,HI, Canada	$15.00	$19.00	$23.00	*for quote*

48 States shipped via UPS surface or U.S. Mail. AK and HI shipped 2nd Day Federal Express. Canada shipped by air mail unless UPS specifically requested.

PAYMENT BY:

☐ Check ☐ Money Order ☐ VISA ☐ Mastercard ☐ Discover

Card No. _____ Expiration Date _____

1. All payments must be in U.S. Dollars (Sorry, NO C.O.D.)

2. Kit parts are warranted for one year to be free from manufacturing defect.

3. Any T-KIT may be examined, returned complete and UNASSEMBLED in fully-reuseable condition, within 30 days of shipment date, for full credit or refund, less original shipping/handling charge. Customer pays return shipping.

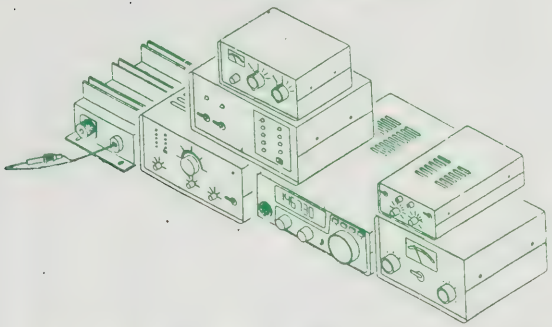
Visit our website: www.tentec.com

SHIPPING WEIGHTS

KIT	PAGE	LBS.
1000A	13	1
1000B	13	1
1000C	13	2
1001	13	1
1050	14	1
1051	12	1
1054	14	1
1054C	14	2
1056	15	1
1059	12	1
1061	14	1
1064	13	1
1130	18	2
1201	18	1
1202	8	3
1203	8	1
1207	16	2
1208	4	4
1208A	4	4
1209	5	4
1209A	5	4
1210	17	4
1210A	17	4
1220	10	5
1222	11	1
1230	9	5
1251	9	3
1252	6	3
1253	6	4
1254	3	5
1260	5	5
1320	7	4
1330	7	4
1340	7	4
1380	7	4
1550	16	1
1551	16	1
1552	15	1
1553	12	1

T-KIT
A Division of **TEN-TEC**, Inc.
1185 Dolly Parton Parkway
Sevierville, TN 37862-3710

Now, it's time for T-KITS!



While the Ham/Electronics World has been lamenting the grand old days of kit-building, the TEN-TEC team of hams, engineers and technicians has been working to bring those days back to you!

FIRST CLASS MAIL

TO:

...America's Best!

TEN-TEC

DAYTON 2002

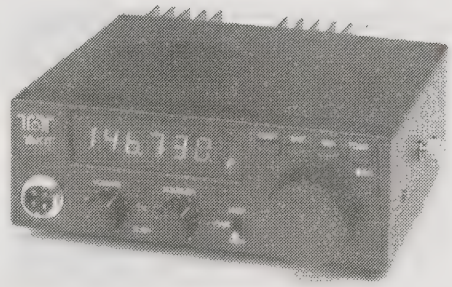
T-KIT

RADIO KITS & ACCESSORIES CATALOG

T-Kit MODEL 1220 transceiver

The Model 1220 FM/Data Transceiver shows just how serious T-KIT is about filling the big void in ham radio kit building. Why pay hundreds more? You do NOT have to rely on imports for a 2-meter FM transceiver with the modern features which today's hams take for granted. And you won't have to settle for a stripped down performance of other VHF kit transceivers. You'll learn from building it how to take care of it yourself.

T-KIT



T-KIT Model 1220 Transceiver Features:
- Advanced microprocessor-controlled design
- Front-panel knob tuning of 143.500-148.500 MHz in 5kHz (or 2.5 kHz) steps
- 15 Memories store frequencies with repeater offsets and sub-audible tones!
- Store up to five non-standard TX offsets (CAP, MARS, etc.)
- Bright 6-digit LED display resolved to 5kHz channel tuning steps
- LED indicators for TX Offsets, Simplex, RX Busy, TX On-Air, CTCSS tone ON
- Built-in speaker plus external speaker jack
- Optimized, standardized packet circuitry, standard DIN connector
- Hand Microphone and Mobile Mount…..Both included!

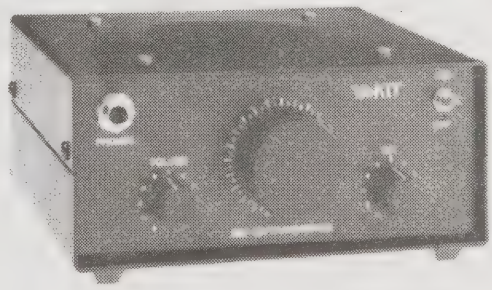
Model 1220 Typical Specifications: Sensitivity .2 uV for 12 dB SINAD. Deviation +/- 5 kHz. Dynamic Range: 70 dB (2 tone, 3rd order IMD @ 20 kHz from 146 MHz (. Adjacent channel rejection: 70 dB (@ 20 kHz from 146 MHz).

Build it now for 5 Watts or 30 Watts, or upgrade to 30 Watts later
- Contemporary molded front panel and steel case are standard, not extra!
- Instantaneous, silent PIN diode T-R switching
- Full CTCSS sub-audible TX tone set BUILT-IN, microprocessor-controlled

T-KIT Model 1220 Transceiver Kit, 5 Watts Output
Model 1222 30 Watt amplifier module kit for Model 1220

Take your favorite CW band anywhere !

Ten-Tec began in 1968 with the release of very inexpensive "QRP" transceivers. We thought it would be fun to revisit those roots. We explored today's RF technology and components to see just how inexpensive, compact and simple a quality QRP kit rig could be. The low price and great receiver design make those QSK VFO-controlled transceivers a smart choice for those times and moods when you want to try a few watts of RF output. Get on the air from the beach, or a mountaintop, or your office or dorm room!



Frequency Coverage: VFO tuning of any 50 kHz segment of CW sub-band. Tuning range is selected during winding of one toroid in the VFO circuit.
Frequency Control: Varactor tuned oscillator with potentiometer control. Temperature compensated LC components stabilize VFO.
RIT: (Receive Incremental Tuning) +/- 1.5 kHz.
Antenna: 50 ohm unbalanced, SO-239 connector.
Power requirement: 12-14 VDC, 35 mA receive (no signal),80 mA receive (S-9 signal), 800 mA on transmit.
Construction: Black texture painted clamshell-type steel top and bottom, Aluminum chassis, sub-panel and heatsink. One 3.5"x5" double-sided circuit board.
Board-mounted Components: 216 including 4 IC's, 19 transistors, 13 diodes.
Front Panel Controls: main tuning, RIT, volume, DC on-off toggle.
Connectors: front panel 1/4" stereo phone jack; rear panel SO-239 for antenna, 3 RCA jacks for key, DC input, accessory DC output.
Dimensions: HWD 2.75"x6"x6". Weight 2.25 lbs/1.02 kg.

TRANSMIITER:
RF Output: 3 watts typical, no external adjustment.
T/R Switching: solid state, full break-in.
CW Offset and Sidetone: Adjustable 400-1000 Hz sidetone automatically tracks offset frequency.
Sinewave sidetone has internal adjustment.

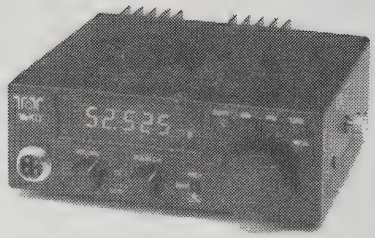
RECEIVER:
Type: single conversion superhet, JFET mixer.
Sensitivity: .25 uV typical for 10 dB S/N.
Selectivity: 4-pole crystal ladder filter (1 kHz nominal bandwidth)
AGC: audio derived
IF Frequency: 11 MHz on 80 and 40 meter models; 14.32 MHz on 30 meter model; 6.14 MHz on 20 meter model.. 16 MHz on 15 meter model.
Audio: 300mW @ 4 ohms. Built-in 3" speaker.

T-KIT Model 1315 for 15 Meters
T-KIT Model 1320 for 20 Meters
T-KIT Model 1340 for 40 Meters

T-KIT Model 1330 for 30 Meters
T-KIT Model 1380 for 80 Meters

T-Kit MODEL 1260 transceiver

- **15 programmable memories**
- **Ready for 6M's varying transmit offset schemes**
- **Microprocessor-controlled**
- **Complete with microphone, internal speaker and mobile bracket**

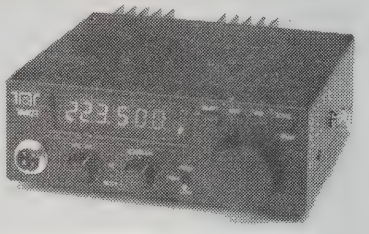


Read about the 1220 2M transceiver and imagine the same great-looking rig ready for easy and fun 6M FM repeater or simplex action, no matter what kind of transmit offset scheme is employed! FCC regulations currently prohibit the sale of an add-on amplifier, but our happy transverter owners can tell you that a few watts on 6M is a blast!

T-KIT MODEL 1260 5-Watt 6-Meter Transceiver KIT

T-KIT MODEL 1230 Transceiver

2-Meters Getting Crowded? Discover 220 MHz Action!



Engineered specifically for the 222-225 MHz band, using integrated 220 MHz RF power module for simplified construction and alignment. Front-panel switching of 4-5 watts or 20 watts of RF output. Shop around: the Model 1220 is the lowest-priced 220 MHz rig on the market with the features you need and expect. Microprocessor-controlled, 15 memories, tunes 221.800 – 225.200 MHz in 10 kHz steps, plus Memory Scan. General operating features similar to Models 1220 and 1260.

T-KIT MODEL 1230-20 Watt FM Transceiver KIT

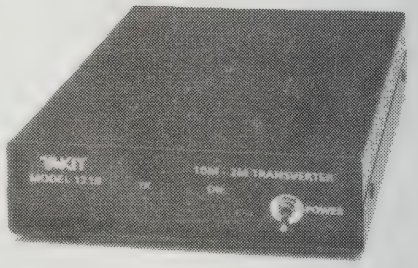
Includes microphone and mobile mounting bracket.

T-KIT MODEL 1210 Transceiver

For only $139, add 2 meters to any HF transceiver. Ideal new use for all those idle 10 meter mobile rigs. Full 10 watts RF output. ALC-controlled 10M input handles power range of 4 to 20 watts. Solid-state T-R switching. Engineered from scratch for optimized 10M-2M conversion performance. Compact: 1.5"H x 5"W x 8"D.

Model 1210 Specifications:
Frequency Coverage: 144-148 MHz band, typically 144-145.7 MHz, based on 28-29.7
MHz tuning range of most 10-meter transceivers. 116 MHz local oscillator.
Power requirements: 12-14 VDC, 100 mA receive, 600 mA in transmit with no drive, 2.0A on transmit at 10 watts output.
Construction: Black texture painted clamshell-type steel top and bottom, aluminum panel/chassis and heatsink. One 5.5"x3.75" double-sided circuit board.
Semiconductors: 2 IC's, 13 transistors, 25 diodes, RF final: BLW81.

Operate 2 Meters In Any Mode with Your 10 Meter Transceiver!



TRANSMIT:
RF output: 10 watts maximum on CW and FM, 10 watts PEP on SSB.
T/R switching: solid state, RF sensing.
Output Power Adjustment range: 2 to 10 watts.
Spurs and Harmonics: Greater than –56 dBc at 10 watts.
Standard TX Hang Time: Approximately 1 second.
Input Drive: Less that 0.5 watts input to key TX mode. 4 Watts input for 10 watts output. Input drive is ALC controlled between 4 and 20 watts. Input SWR less than 1.5:1.

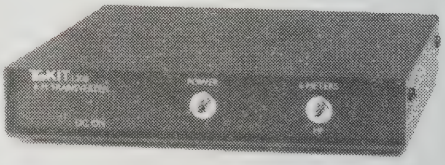
RECEIVE:
Conversion Gain: Approximately 17 dB.
Image Rejection: Greater than 60 dB.
Input Intercept: -6.5 dBm typical.

T-KIT Model 1210 10M-2M
Transverter KIT
Model 1210A Factory Assembled,

T-Kit MODEL 1208 transverter
SSB-CW-FM 6-Meter Transverter

Let's Get Together and REPOSSESS 6 Meters!
The T-KIT 1208 Transverter lets new technicians and old-timers alike repossess 6-Meters at a VERY nice price!

Add the excitement of the 50 MHz amateur band so easily to ANY modern ham transceiver, including all those 20-Meter only QRP rigs. A Transverter lets you transmit as well as receive on 6-Meters, using the precision digital tuning, available modes, memories and other features of your HF transceiver. It's simple: 14.000 MHz on your display or dial is 50.000 MHz. To operate SSB on 50.200 MHz, simply switch the 1208 to 6-Meters, tune to 14.200, keep transceiver RF output under 5 watts, and just got for it! The 8 watts RF output is generous power during good band openings and for local communications and repeaters.



Features:
- **Use with any transceiver capable of 3-5 watts on 20-meters.**
- **Extremely simple hookup and operation.**
- **Low-noise 50-54 MHz receiving input.**
- **Easy front-panel switching between HF and 6M operation.**
- **Fast, silent RF-Sensing PIN diode T-R switching for QSK and data communications.**

T-KIT MODEL 1208 Six-Meter Transceiver Kit.

Specifications and Operating Requirements: 12-15 VDC at 3.0 amperes external DC power requirement. RF output at 51 MHz: 8 watts typical. • Standard 20M transceiver required for basic 50.000-50.350 MHz Beacon/CW/SSB operation. •FM operation requires FM transmit/receive capability of a general coverage transceiver capable of 14-16 MHz operation, with repeater offsets being a function of the transceiver's VFO memory system.• Receive 50-54 MHz; transmit 50-52 MHz (transmitting above 52 MHz is not recommended). •The 14 MHz transceiver output MUST be attenuated to 5 watts or less.

We Accept: VISA • Mastercard • Discover

T-Kit MODEL 1209 transverter

8 Watts RF output on 6 meters from your 2 meter rig or HT

More Ways to Explore 6 Meters!

Newly-licensed hams: explore your operating privileges beyond 2 Meters very economically! Operate 5-54 MHz on any mode covered by your 144-148 MHz rig or HT. With the same general features and specifications as our popular 1208 6-Meter Transverter, the Model 1209 was designed for those regions where 6M FM repeaters take the load off the busy 2M systems. And you may find yourself making cross-country simplex QSO's during those exciting 6M band openings.

Just Think: Only $304 gives you BOTH 2 meters and 6 meters.....If you build and use the 1220 Transceiver and 1209 Transverter!

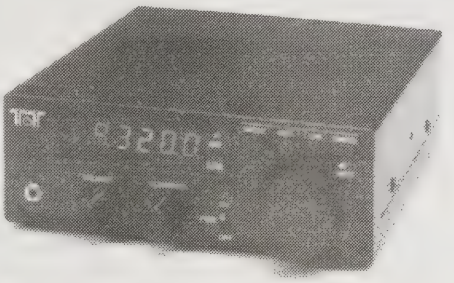
T-KIT MODEL 1209, Six-Meter Transverter Kit

No. 1209A, factory assembled
No. 1208, 20 to 6 version NOT available factory assembled.

T-Kit MODEL 1254 Receiver

Enjoy TEN-TEC receiver quality with digital tuning for worldwide AM-SSB-CW, from 100kHz to 30 MHz!

T-KIT Shortwave Receiver Model 1254: only $195 and the smoothest kit-building experience you can imagine. The grand tradition of receiver kit building is no longer confined to direct-conversion or regenerative designs! The model 1254 combines the satisfaction of a serious kit building experience with the performance features expected in a modern HF receiver at a very competitive price. You will build a true dual-conversion superhet with a microprocessor-controlled frequency synthesizer. Building this receiver yourself gives you the assurance that you can maintain it in perfect working order.



BUILDING SKILL LEVEL: Intermediate BUILDING TIME: 20 to 25 hours

Frequency coverage: 100 kHz to 30 MHz Modes: AM, SSB/CW
Main Tuning: Normal or Fast tuning (2.5 kHz SSB, 5.0 kHz AM, or 100 kHz steps for either mode)
"Clarifier" Control: for +/- 1.5 kHz SSB/CW fine tuning between 2.5 kHz steps
Front panel controls: On/Off switch, Tuning, Volume, Clarifier, Mode Select, Memory Write (MW), VFO/Memory tuning select (V/M), Tuning Rate Select (SPEED)
Memories: 15 programmable memories
Circuit: Synthesized 45-75 MHz local oscillator, 45 MHz first I-F, 455 kHz second I-F
Sensitivity: AM mode: 2.5 uV for 10 dB SNR at 30% modulation SSB/CW mode: 0.5 uV for 10dB SNR
Selectivity: 4kHz @ -6 dB
Frequency/Memory Display: 6-digit green LED with mode indicators
Power Supply: 12-15 VDC, 250 mA current consumption with no signal present. 15 VDC @800 mA wall transformer supply included with kit.
Antenna Connector: 50 ohm input, RCA style phono jack
Audio: 1.5 watts audio output to internal speaker, plus 1/8 inch stereo phone jack for standard personal headphones or direct feed to 4-8 ohms external speaker, data interface or both.
Semiconductors: 10 IC's, 26 transistors, 16 diodes
Compact Size: 2.25" x 6.5" x 6.5" (HWD)
Construction: Steel clamshell case, aluminum chassis, and custom-molded front panel.

EASY ALIGNMENT!
Yesteryear's serious superhet receiver involved many dozens of alignment points, usually requiring professional service equipment, often scaring away the casual hobbyist. To "align" your state-of-the-art Model 1254, you need only a VOM and your ear! During kit construction, we provide Progress Tests for each of the 6 assembly phases. The receiver generates its own built –in 45 MHz test signal.

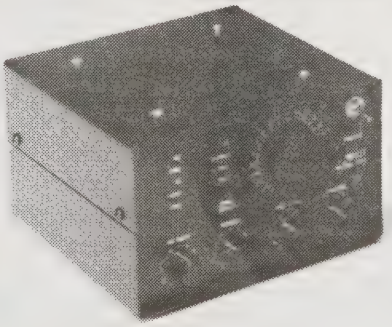
T-KIT MODEL 1254

T-Kit MODEL 1253 Receiver

The classic "first radio kit" is back and better than ever!

We've combined the very same audio circuit of TEN-TEC transceivers with a modern FET design for classic regenerative SWL receiving plus one-button electronic band switching. The result is an easy-to-build shortwave radio that's fun and interesting for the whole family. No alignment required. Simply install all parts as directed, put together the high-quality mechanical parts, and start enjoying the magic of shortwave radio. Explore 9 smooth tuning SWL and ham bands from 1.8 to 22 MHz at the push of a button! Receives AM, SSB, CW and all those other magical shortwave sounds.

Features: Front-panel RF gain, Volume, Regeneration, Tuning and Fine-Tuning controls. Generous audio from Signetics TDA 2611A to built-in speaker or stereo phone jack. Electronic switching of 9 tuning ranges. Rugged, rounded clamshell steel enclosure. Simple, clear linear logging scale for large tuning knob. Requires 8 alkaline C cells or external 12VDC.



9-Band Shortwave Receiver

T-KIT MODEL 1253

On a tight budget with a club of eager radio builders? Our 4-Band **Model 1054** Module Board Kit has comparable features for only **$24!**

Compact RF ground Counterpoise

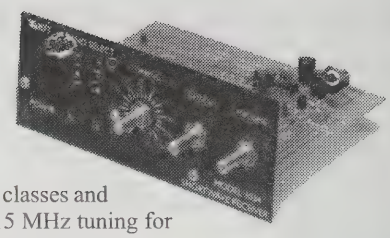
At a fraction of the cost and size of other "artificial ground" gadgets, the T-KIT 1251 helps solve those annoying RFI/TVI and "hot chassis" problems caused by a lack of proper RF ground. Ideal for condo and travel situations where PVC plumbing makes classic water pipe grounding schemes impossible or if a good ground is too far away from the station. While NOT a substitute for a vertical's radial system or for the basic safety grounding required for all installations, it does provide a "tuned counterpoise" to satisfy the transmitter's need for a correct RF ground path.

T-KIT MODEL 1251

T-Kit MODEL 1054 Receiver

(Kit INCLUDES drilled, painted, silk-screened aluminum front panel!)

A New World of *Budget-Priced* Receiver Projects!



Here it is: Proof that the classic "first receiver" project need not be more expensive today than your favorite 1950's kits.

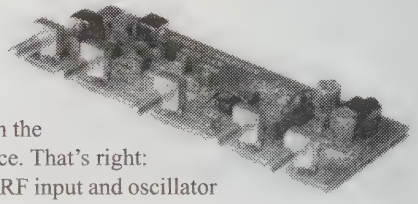
In fact, this great little receiver beats the pants off those 3-tube radios with the big plug-in coils. Excellent for clubs, classes and family activities. Band coverage: 49 Meter SWL band, 40 Meter ham band, 31 Meter SWL band, plus exciting 12-15 MHz tuning for daytime shortwave listening, 20 Meter ham band and all those other magical shortwave sounds. The sharp-looking front panel gives the "real radio" look right away: dress up your project later with a case and knobs, and perhaps a speaker. You can enjoy the basic kit just by hooking up 9 to 12 volts DC, setting up a modest wire antenna (10 feet or more of hookup wire) and plugging in your own stereo headphones (1/8" plug). Features convenient push-button band switching, on-off switch, "on" LED, tuning, volume, regeneration control. *User provides speaker or headphones.*

T-KIT MODEL 1054
Suggested Enclosure-Plus Pak, No. 1000B

Attention Club Leaders!
No. 1054C CLASS-Pak:
Includes five 1054 Receiver Kits, Instructor's Notes, Spare-Parts Kit,

T-Kit MODEL 1056 Receiver

"ANY BAND" Direct-Conversion SSB/CW Receiver



This is your best buy, by far, for a ham band direct conversion receiver kit. It has better audio and filtering than the others, and we supply the parts and instructions to let you build or for (or change it to) ANY band of your choice. That's right: YOU choose the band! Many hams KNOW that there are only minor coil and capacitor differences in the simple RF input and oscillator sections of a basic direct-conversion receiver. We give you ALL parts needed to build for your choice of 160, 80, 75,40,30,20,17,15,12 or 10 meters! Try out you own multi-band switching ideas. Start planning a budget-priced QRP transceiver that will really WORK!

Design Features:

- •Signetics NE612 mixer-oscillator
- •True varactor tuning (MV209)
- •Zener diode regulation
- •LM358 op amp bandpass filter
- •Front-panel bandpass control
- •Signetics TDA2611A audio amplifier IC
- •Stereo jack for economical "Walkman" headphones
- •Plenty of speaker audio
- •Separate "Bandset" and s-m-o-o-t-h 20 kHz "Bandspread" tuning controls!
- •RF gain control
- •Provision for TX sidetone injection
- •Provision for receiver audio muting during transmit
- •Efficient 6 " Wx2" D board layout; take your favorite ham band ANYWHERE!
- •Jumper provision for separate DC supply to audio IC
- •Operate on 12-15 VDC

T-KIT MODEL 1056
Suggested Enclosure-Plus Pak, No. 1000C

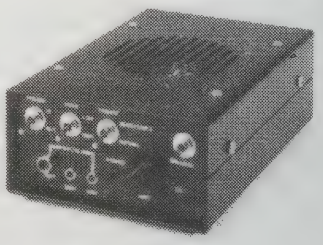
NOTE TO BEGINNERS: Contrary to some advertising claims, a direct-conversion receiver is very good for CW/SSB but cannot provide very pleasant listening for short-wave AM broadcasts (BBC, Radio Moscow, VOA, etc.).
For general listening, we suggest **T-KIT MODEL 1054 or 1253.**

TeKIT

T-KIT No. 1252

Hi-Sensitivity Audio Amplifier With Experiments

Listen to the Mysterious Sounds of ENERGY!



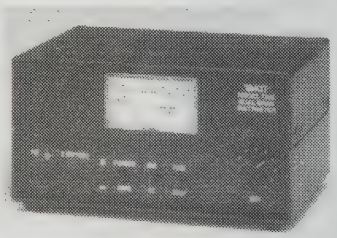
A wonderful project for experimenters of all ages!
Build a rugged, versatile, portable utility amplifier (for which you'll find dozens of practical uses over the years). Then, begin to explore the fascinating world of the unique sounds made by all kinds of energy – from lightening whistlers on the other side of the world to the stress noise of a bending paperclip. Listen to radar, to light waves, to your computer. Listen to nearby radio signals on any frequency, any mode. In addition to the kit assembly manual, you get a fascinating project booklet based on experiments by USAF Engineer Calvin R. Graf as your guide to adventures with the sounds of energy. Amplifier features hi and low Z inputs, switchable preamp, 1.5W output. Requires 8 "AA" batteries or external 12-15 VDC.

T-KIT No.1252

Note: The kit includes accessories for many of the energy listening experiments. You will need 1x2" wood (furring strips) and wire to build the 4' loop antenna explained in the project booklet.

20/200 Watt SWR Bridge & RF Wattmeter

... For BOTH 1.8-30 MHz AND 144-148 MHz!



Build this top-quality station accessory that you'll use for a long, long time. Features easy-to-read meter, front panel switching of 20 or 200 watt ranges, HF or 2-Meters, sensitivity control, four SO-239 antenna and transmitter connectors, all housed in a rugged steel enclosure less likely to bounce at the mercy of RG-8 coax! Range: 1.8 to 30 MHz plus 2 Meters! Separate HF and VHF connectors let you leave the unit in-line with BOTH rigs. Convenient toggle switching between HF and VHF. This is your USE-ANYWHERE RF power/SWR meter system!

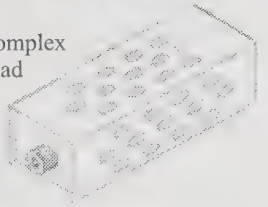
T-KIT Model 1202 SWR Bridge Kit

We Accept: VISA • Mastercard • Discover

RF Dummy Load - 50-Ohm, 300 Watts

"I know I SHOULD be using a dummy load for this test. Will this giant surplus resistor work? What's the impedance of this big old light bulb?"

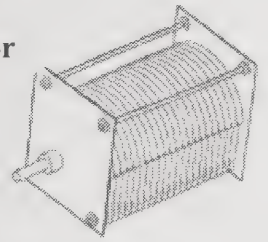
YES, a dummy load is the least exciting of all radio tools. But, there are those times when it's the right tool for the job. Your complex transceiver suddenly acts like a QRP rig: is it the rig, the tuner or the antenna? Loading the rig directly into the 1203 Dummy Load will report the basic health of your transmitter section. Save $$ by building this easy kit yourself. With many common-sense uses, this is the boring accessory you'll really appreciate whenever you start to wonder what's going on with ANY transmitter setup. Good for HF and VHF.



T-KIT No. 1203 Dummy Load Kit

T-KIT No. 1207 40-500 pF Rated 3.5 KV

Yes, You can build a
High-Power Variable Capacitor



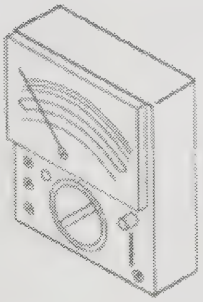
What? Me build a capacitor? Air-variable capacitors cost $$$ these days because of all the hand labor of putting them together. If you'd like to spend part of an evening reliving those grand old Erector Set days, save money by assembling your own high-power variables from our top quality factory-ware. Build the same tuning capacitors use in world-class TEN-TEC 1.5 KW RF amplifiers and tuners. Great for all high-power homebrew projects, including experimental loop antennas.

T-KIT No. 1207 also available as(TEN-TEC assembled **No. 80-858)**

Economical Multitester

We found this great value in a taut band, mirrored scale VOM with handy extra features. We were so impressed with its performance that we decided to offer it here for sale to our customers. (Not a Kit: assembled only.)

20,000 ohms/volt
DC volts: 0.1, 0.5, 2.5, 10, 50, 250, 1000
DC current: 50uA, 2.5, 25, 250 mA, 10 A
Resistance: to 20 megohms
AC volts: 10, 50, 250, 1000



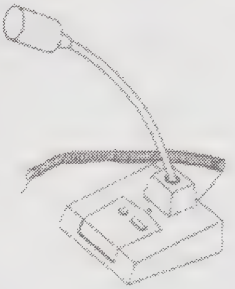
Audible continuity checker
hFE transistor testing
Built-in battery tester
Rear panel pop-out stand
4"W X 6"H X 1.5"D

TEN-TEC Model 1130 Multitester assembled

Communications Desk Microphone

If you want your station to have the same quality of desk mike expected by demanding TEN-TEC transceiver users, at a great price savings, here's your chance to build and learn all about a proven desk-style communications mike that will compliment and HF or VHF transceiver.

T-KIT 1201 Mike Features:
Choice of PTT or VOX operation.
Electronic lock and release of PTT.
Sensitive op-amp preamplifier.
LED "on" indicator.
Type: Electret Condenser.
Sensitivity: -52 dBV/1 ubar
Uses 7-14 VDC from rig or internal 9V battery.

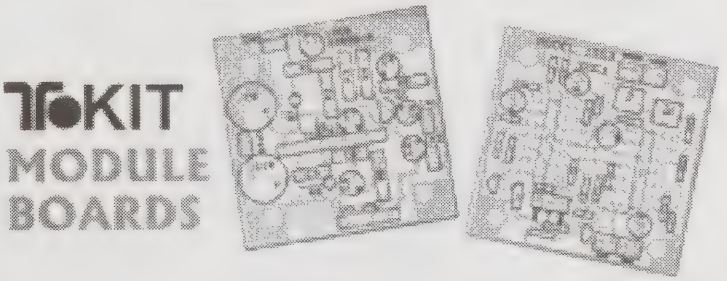


T-KIT no. 1201 Desk Microphone Kit
TEN-TEC Model 705 (factory wired/tested)

MICROPHONE CONNECTORS: Because various styles of connectors or plugs are used in ham and audio equipment, the 1201 microphone kit is shipped WITH shielded coil cable but less connector. RadioShack stocks most standard connectors. Current TEN-TEC microphones include 4-pin connector standard for all TEN-TEC and T-KIT transceivers.
TEN-TEC No. 35057, 4-pin microphone connector, $3.00

T-KIT MODULE BOARDS

These "smaller" but carefully engineered T-KIT boards are for hams and experimenters who use their own hardware and ingenuity to custom-finish a project. You get the circuit board with all needed I/O pads, all board-mounted parts, a well-engineered circuit and the same high quality step-by-step instruction manual that is the hallmark of all T-KITS. Finish the job with your own switches, connectors and enclosure, or a get a great head-start with a T-KIT Enclosure-PLUS Hardware Pak featuring TEN-TEC's easy-to-use blank aluminum boxes, plus a useful assortment of finishing hardware and components.



Utility Audio Amplifier

Need a quick, reliable, inexpensive audio amplifier stage for that homebrew project? This careful design gives your project the very same audio output circuit that we use in today's TEN-TEC transceivers! Enjoy 1.5 watts of low-distortion audio with no worry about motorboating and other unwanted oscillations. Includes optional preamp input for 10 dB gain. Important: This circuit is designed for 12-15 VDC.

T-KIT No.1550

Foxhunt "Beep-Beep" Transmitter (for FM Broadcast Band)

Here's a great gadget at a great price for clubs, classes, scout troops and packs, camps and family fun! Tune it to any quiet part of the 88-108 MHz FM band per FCC Part 15 rules, noticing its distinctive "beep-beep" modulation, and let the kids use their own FM portable radios to discover the basics of direction-finding. Hide it indoors on rainy days! Includes board-mounted on-off switch and 9V battery snap. Use several to demonstrate triangulation.

T-KIT No. 1059

We Accept: VISA • Mastercard • Discover

MORE T-KIT MODULE BOARDS.....

Universal Low-Noise Broadband DC to 1 GHz RF Preamp

You KNOW that every kit company sells some sort of broadband preamp for all purposes. If you want to try a broadband, untuned RF preamp on any receiver or scanner or other instrument, THIS one is your best buy! Excellent noise figure, gain and frequency coverage at a BUDGET PRICE! Up to 18.5 dB gain at 100 MHz. 17 dB gain typical at 500 MHz. Supply voltage: 8-14 VDC.

T-KIT No. 1001

"Smart Squelch" Band Opening Alert

Also known as the DXer's "integrating squelch," this great circuit liberates your family from hiss, whines and other noises when your receiver is tuned for those unpredicatable openings on any HF or VHF band that usually seems DEAD. This "integrating" squelch responds to the cumulative effect of several seconds of weak signal rather than to isolated noise bursts. Connect between rig and external speaker; no receiver modification required. You supply creative 12 VDC alarm devices (piezo, chime, strobe light, etc.) Also may be used to add conventional squelch to older receivers, any mode.
(Strong signals break squelch quickly.)

T-KIT No. 1064

Suggested Enclosure-Plus Pak, 1000A

Transmatch Tuning Bridge

Have you ever wondered what good one of those $60-$100 "R-X Noise Bridges" could do for YOUR station setup? Are you baffled by your antenna tuner or "transmatch"? The 1051 is easy to build and super easy to use. No "R-X" controls, calibration or calculations needed. Just connect it between your rig and antenna tuner, set the receiver to the desired operating frequency, and adjust the antenna tuner until the distinctive modulated pulses (Not Just Noise!) drop to an easily recognized "NULL" indicating that the tuner offers a 50-ohm match to your transceiver. No on-the-air nervous experimenting with the tuner controls.

T-KIT No.1051

Suggested Enclosure-Plus Pak, No. 1000A

Microphone Speech Processor

While speech processing IS a standard feature of today's SSB transceivers, there's plenty of nice equipment at hamfest flea markets, which can benefit significantly from the addition of this proven speech processor circuit used in many TEN-TEC transceivers. If there's room, build it into that older rig. Or, design it into that audio console you've been planning, or just use a neat TEN-TEC box!

T-KIT No. 1551

Suggested Enclosure-Plus Pak, No. 1000A

T-Kit MODEL 1050 Receiver
Universal BFO for SWL Receivers

Got an old (or very new) AM-only shortwave radio with no CW-SSB capability? If you want to enjoy casual CW-SSB reception, this varactor-tuned 455 kHz oscillator may be built into larger receivers or else mounted in its own case and placed near your portable SWL radio. The on-board tuning control compensates for alignment variations from one receiver to another in addition to permitting fine-tuning of SSB/CW signals. Operates on 6 to 15 VDC.

T-KIT MODEL 1050

Suggested Enclosure-Plus Pak, No. 1000A

Active Antenna for Receivers

If you've been curious about what an "active" receiving antenna can or cannot do, without paying the $40-$100 cost typical of both kit and manufactured units, you will enjoy the experience, learning about and using this very simple, budget-priced kit. Just for fun, we carefully tested this little T-KIT 1552 Module board next to active antennas sold by Heath, MFJ, and Ramsey. Wow: you'll get the performance without the price tag! Bring ANY HF receiver to life with the 1552 and a small length of wire, or a simple whip antenna! Compact 1.75" square board can be mounted inside a receiver or in its own small box. Circuit includes gain control; operate on 6 to 15 VDC.

T-KIT No. 1552

Suggested Enclosure-Plus Pak, No. 1000A

Budget Electronic Keyer

A classic circuit and a nice price make this a great project for beginners or for building into extra rigs. Includes speed control, weight control (rarely offered in "simple" CMOS circuits) and sidetone pitch control. A lot of keyer for the price, it features self-completing dits and dahs for standard single-level keyer paddles. While not designed for iambic operation, the price and reliability make the 1553 a very nice introduction to electronic CW keying.

T-KIT No. 1553.

Suggested Enclosure-Plus Pak, No 1000A

T-KIT ENCLOSURES-*Plus* hardware Packs

With three sizes to fit all T-KIT Module Boards, these nifty enclosures-PLUS Hardware paks give you real choices for dressing up your small kit projects:

- **Dig through and make good use of your own parts collection**
- **Shop[at Radio Shack, local distributor or next hamfest**
- **Enjoy the practicality of a T-KIT ENCLOSURE-PLUS Hardware Pak**

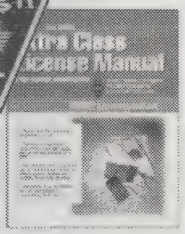
All Enclosure-Plus Hardware paks include: TEN-TEC TP-series aluminum box suitable for your project, mechanical hardware, plus helpful toggle switches, knobs, etc. You may get more than needed for one project: all the extra goodies to your parts drawers for your next T-KIT MODULE BOARD project!

Connectors: Since there are so many **different** hookup methods useable for RF, DC, audio, and other connections, we must leave it up to you (or your Radio Shack store, ham buddy or hamfest) to choose what's handiest for rear-panel hookups.

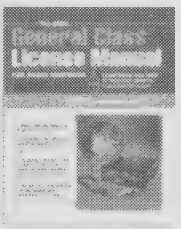
THREE Convenient T-KIT Enclosure-Plus Hardware Pak sizes:

• T-KIT No. 1000A (standard)
(TP19 box (2x4-3/4x4), DPDT toggle, wire/mini-coax pak, knob, misc. hardware.)
• T-KIT No. 1000B (medium) (tops in value and general usefulness)
(TP41 box (2-1/4x5-1/2x4-1/4), DPDT & SPDT, 3 knobs, wire/coax pak, hardware.)
• T-KIT No. 1000C (deluxe)(for 1056 receiver, similar projects.)
(TP45 box (2-3/4x6-1/2x5-1/2), SPDT,wire/coax hardware, 5 knobs, 3" speaker.)

ARRL PUBLICATIONS

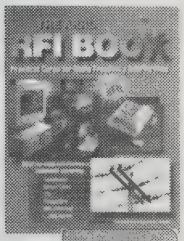


License Manual: Extra Class. ARRL study guide for the Extra Class license exam. Includes the latest question pool. Detailed explanations for all questions, including FCC rules.
ORDER # R5000



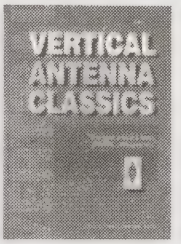
License Manual: General Class. ARRL study guide for the General Class license exam. Includes the latest question pool. Detailed explanations for all questions, including FCC rules.
ORDER # R5001

License Manual: Tech Q&A. ARRL question and answer guide for the Technician class license exam. Includes brief explanations after each question.
ORDER # R5002



Radio Frequency Interference. The authoritative source for practical interference cures. Automotive, television, computers, lamps, VCR's, TV's, power lines, electric fences and a host of other interference sources are discussed along with a wealth of practical information on problem solving.
ORDER # R5014

Stealth Amateur Radio. Set up and operate a station without calling attention to yourself. Operate successfully at QRP power levels. Install safe antennas, including indoors. Tips on portable operation from campgrounds, motel rooms, etc.
ORDER # R5015

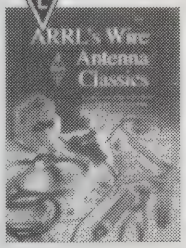


Vertical Antenna Classics. Descriptions and construction information on vertical antennas. Vertical antenna theory and modeling for HF, VHF and UHF. Directional arrays, radials and ground systems, and more.
ORDER # R5017

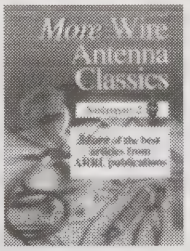
ARRL Repeater Directory - NEW for 2001-2002

The latest listings from the U.S., U.S. territories, and Canada. CTCSS tone, DCS access control and frequency information for thousands of HF/VHF/UHF repeaters in a pocket sized reference book.
ORDER # R5013

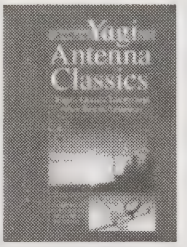
ARRL Antenna Classic Books



Wire Antenna Classics. An entire book devoted to wire antennas, from simple to complex. Includes articles on dipoles, loops, rhombics, wire beams and receive antennas. An ideal book for Field Day planners or the next wire antenna project at your home station.
ORDER # R5020



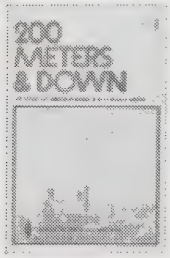
Wire Antennas Classics, volume 2. Filled with innovative wire antenna designs from the pages of QST and other ARRL publications. Experience the satisfaction and enjoy the benefits of building your own wire antennas.
ORDER # R5021



Physical Design of Yagi Antennas. by David Leeson W6QHS. A book concentrating on the physical properties of Yagi antennas. How to build them tough the first time so they'll stay up for many years to come.Tips for poor weather, wind problems, etc.
ORDER # R5011

Yagi Antenna Classics. Yagis, Quads, Loops and other Beam Antennas. Includes some of the very best articles written about beam antennas. Covers monobanders, multibanders, HF, VHF and UHF beams from 3.5 to 2304 MHz. Information on computer modeling, towers, masts and guys.
ORDER # R5022

MORE ARRL BOOKS.....



200 Meters and Down. The history of the early days of amateur radio from Marconi through the spark era and the dawn of CW operation on the 'useless' amateur radio frequencies above 200 meters.
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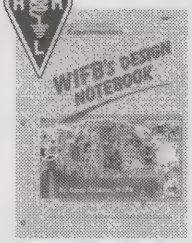

W1FB Design Notebook. Practical projects by Doug DeMaw, W1FB, that can be built using readily available components and common hand tools. Includes explanations of how circuits work without heavy mathematical analysis.
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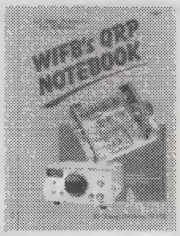

W1FB QRP Notebook. Looking for construction projects for QRP transmitters, receivers and accessories? This is the book. Projects for QRP that you can build and use on the air.
ORDER # R5019

Now You're Talking. ARRL study guide for the Technician class license exam. Easy to understand theory and rules explanations. Illustrations and photos. Entire exam question pool with answers and page references.
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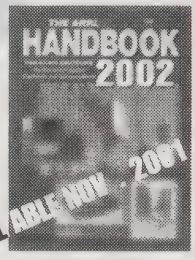
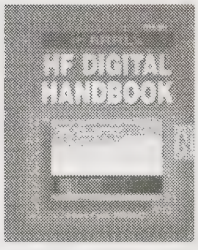
Antenna Compendium Volume 6. All new articles covering low band antennas and operating, 10 meter antenna designs, multiband antennas, propagation and terrain assessment. Includes a CD-ROM with propagation prediction software.
ORDER # R5004



ARRL 2002 Handbook – . 79th edition. The standard reference book for radio amateurs, electronics technicians, and professional engineers. 1200 pages. Everything for the active radio amateur from operating techniques to advanced design theory is presented.
ORDER # R5005



HF Digital Handbook. Operating tips on everything from traditional RTTY to modern digital modes like PSK31 and MFSK16. Internet e-mail via HF radio. Complete technical specifications of various digital modes.
ORDER # R5006

Log Book. Spiral bound. Entry columns for all relevant contact information such as date, time, band, mode, station worked, signal reports exchanged, name and QTH info and QSL card routing.
ORDER # R5007

Low Power Communication. Tips on low power operating, selection of appropriate equipment, antennas, emergency operating, solar power and more. Written by Rich Arland, K7SZ.
ORDER # R5008

ON4UN's Low Band DXing. A must for DXers and contesters or casual operators who occasionally venture onto the low bands. The standard reference guide for operating techniques and antenna construction on the 40, 80, and 160 meter HF amateur bands.
ORDER # R5009

ARRL Operating Manual. The practical "how-to" book of ham radio. 400 pages. Operating basics, contest operation, digital modes, shortwave listening, VHF/UHF operation, FM operation, slow and fast scan television, DXing and more. Many charts and tables.Grid square maps, band plans, beam heading charts, CW abbreviations, etc.
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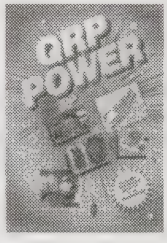
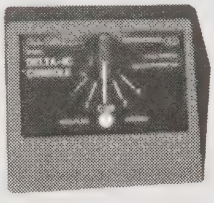


QRP Power. Crammed with projects you can build yourself for 5 watt and below operation. Loads of QRP resource information. QRP-related articles from QST, QEX and the ARRL Handbook are included.
ORDER # R5012

ALPHA DELTA

Delta-2 and Delta-4 coax switches.
Surge protected 2 position and 4 position coax switches using Alpha Delta's ARC-PLUG gas tube protection. Master antenna ground switch position. Low loss constant impedance micro-strip cavity design. Excellent co-channel isolation. Handles 1500 watts output power. Positive detent roller bearing switch drive. Usable to 500 MHz.
ORDER # R9201 DELTA 2 **ORDER # R9204 DELTA 4**

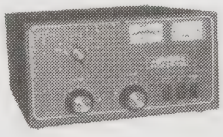


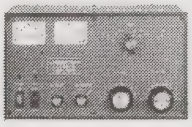
Delta 4C coax switch
Console version of the popular Delta-4 coax switch. Sits conveniently next to your station equipment with no wall or desk mounting required. The connector and console design prevents coax cable from pulling the console switch backward off of the operating table. Internal design is the same as the Delta-4 switch.
ORDER # R9205

AMERITRON

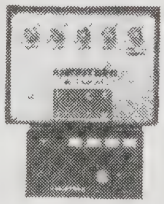
AL-811 and AL-811H linear amplifiers.
Compact desktop HF linear amplifier. 15 through 160 meters, 10 and 12 meter operation by user modification with proof of amateur radio license. 3 tube AL-811 at 600 watts SSB output and 4 tube AL-811H at 800 watts SSB output provides plenty of signal punch above a standard 100 watt HF transceiver. Uses 811A tubes in final amplifier. 17 pound power transformer, full wave bridge power supply. Pi-Network tuned input circuitry. Weight 30 pounds, measures 8" x 13.25" x 16" HWD.
ORDER # R4000 AL-811

ORDER # R4001 AL-811H





RCS-8V remote coax switch with control line
Switch up to 5 antennas on one coax cable remotely without placing 12 VDC on coax cable. Uses separate control cable for antenna switching. Rated for full legal limit output on HF, 1000 watts on 2 meters. Includes indoor control switching box and antenna connection box for outdoor mounting. Powered directly from 120 VAC. Requires 6 conductor control line (not supplied).
ORDER # R9207



.DL-1500 oil can dummy load
)il cooled 50 ohm 'paint can' dummy load handles 500 watts for 5 minutes, SWR under 1.2:1 up to 0 MHz. Low SWR to 400 MHz.
)RDER # R9612

We Accept: VISA • Mastercard • Discover

AMPHENOL

CABLE CONNECTORS

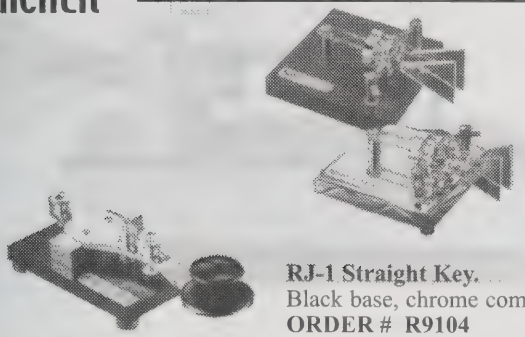
PL-259 connectors:
Amphenol nickel-plated PL-259.
ORDER # R3402
Cable X-Perts silver plated/gold pin PL-259.
ORDER # R3401

RG8X reducers for PL-259 connectors:
Amphenol UG176 (silver)
ORDER # R3404
Cable X-Perts UG176 (silver)
ORDER # R3403

UHF female/female barrel connectors (SO-239 style on each side, for connecting two PL-259 connectors together)
Amphenol 831J
ORDER # R3406
Cable X-Perts RFU536
ORDER # R3412

UHF "T" connectors
three SO-239 female connectors
Amphenol 831T
ORDER # R3405

BENCHER



BY-1 Black Iambic paddle.
Black base, chrome components. Steel base with non-skid feet. Responsive, light touch CW keying from a true iambic paddle. Wide range of tension adjustments. Precision machine components, gold plated sold silver contact points.
ORDER # R9100

BY-2 Chrome Iambic paddle.
Same construction as BY-1, only has a chrome base instead of black.
ORDER # R9101

RJ-1 Straight Key.
Black base, chrome components. Bronze bearing pivots points. Black "Navy" style knob. Steel base with non-skid feet.
ORDER # R9104

Bencher "Skyhawk" 10 element HF tri-band (10, 15, 20 meters) Yagi antenna.
Also usable with reduced performance on 12 and 17 meters. Full sized monobander performance, consistent with boom length. Trapped triband antennas don't approach this performance level. All stainless steel hardware. Computer-optimized trap-free design assures maximum bandwidth, reduced wind loading, and no loss or blown trap problems that plague trapped Yagi antennas. Torque balanced for minimization of rotator wear. The Bencher Skyhawk can be ordered through Ten-Tec and is drop shipped directly to the customer from the Bencher facility in Illinois. UPS shippable.

BUTTERNUT

HF2V 40m/80m vertical antenna.
32 feet height. Can be roof, mast, or ground mounted. Requires no guying. Low radiation angle makes it an excellent choice for low band DXing.
ORDER # R1100

HF6V Vertical antenna for 80/40/30/20/15/10 meters.
26 feet high. An efficient radiator that takes up very little space. Easy to build and tune. No lossy traps! Requires radials, or use with optional CPK counterpoise kit for no-radial operation. 160 meters can be added with optional TBR-160-S 160 meter resonator kit.
ORDER # R1101

HF9V Vertical antenna for 80/40/30/20/17/20/15/12/10 meters. 26 feet high. An efficient radiator that takes up very little space. Easy to build and tune. No lossy traps! Requires radials, or use with optional CPK counterpoise kit for no-radial operation. 160 meters can be added with optional TBR-160-S 160 meter resonator kit.
ORDER # R1102

CABLE X-PERTS

All Cable X-Perts pre-built dipole antennas use #14 copper 7 strand wire and are supplied with center insulator, coax adapter and porcelain end insulators. Add coaxial feedline and you're ready to install.

Part #	Frequency Coverage	Total Span	Center Frequency	ORDER#
Model **DA20**	(20 meters.)	34 feet total length.	14.100	**R1120**
Model **DA1540**	(15 and 40 meters.)	65 feet total length.	21.000 and 7.100	**R1121**
Model **DA75**	(75 meters.)	126 feet total length.	3.900	**R1122**
Model **DA80**	(80 meters.)	130 feet total length.	3.600	**R1123**
Model **DA160**	(160 meters.)	260 feet total length.	1.825	**R1124**

WIRE AND ANTENNA CONSTRUCTION ITEMS

DOG BONES – 2.5" length porcelain antenna insulators. Available in discount packages of 10 or as single quantities.
ORDER # R3006 -10 pk
ORDER # R3007- single pk

14HD #14 stranded uninsulated copper antenna wire.
The standard for ham radio use.
Sold in lengths of 100, 300, 500, or 1000 feet.
ORDER # R3300

Coax Seal – Protects exposed connections from moisture and corrosion. Flexible, can beformed and sealed over odd shaped or difficult coax fittings. Non-contaminating, non-conductive.
ORDER # R1102

Antenna support rope. We offer two Cable X-Perts versions at 3/16" and 3/32". Mildew and abrasion resistant, strong double braid construction, black polyester jacket for Ultra-Violet protection and log life. Ties easily, no extra hardware required. Test strength for 3/16" is 770 pounds, 3/32" is 260 pounds. Each version of rope is available in pre-cut lengths of 100, 250, or 500 feet.

3/32"
ORDER # R3101 -100 ft.
ORDER # R3102- 250 ft.
ORDER # R3103 -500 ft.

3/16"
ORDER # R3104 -100 ft.
ORDER # R3105 250 ft.
ORDER # R3106 -500 ft.

MORE CABLE X-PERTS.....

COAXIAL CABLE -

We offer four different Cable X-Perts 50 ohm low loss coaxial cables. Coaxial cable is sold "cut to order" by the foot. Minimum order is 50 feet for any one piece of cable.

9913FX – Flexible "9913 style" RG8/U coax. 2 shields, 95% tinned copper and bonded aluminum foil shield. Semi solid polyethylene dielectric. Black, non-contaminating direct burial jacket usable from –40 to +85 degrees Celsius. 84% velocity factor. Frequency attenuation per 100 ft @ 30 MHz 0.8 dB, @ 150 MHz 1.6 dB, @ 450 MHz 2.8 dB. Accepts PL-259 connectors.
ORDER # R3201

18267 RG213/U – Single shield, 97% bare copper. Solid polyethylene dielectric. Black, non-contaminating direct burial jacket usable from –40 to +85 degrees Celsuis. 66% velocity factor. Frequency attenuation per 100 ft @ 30 MHz 1.2 dB, @ 150 MHz 2.8 dB, @ 450 MHz 5.2 dB. Accepts PL-259 connectors.
ORDER # R3202

18214 RG8/U - Single shield, 97% bare copper. Foam polyethylene dielectric. Black, UV resistant PVC jacket usable from –40 to +80 degrees Celsius. 78% velocity factor. Frequency attenuation per 100 ft @ 30 MHz 0.9 dB, @ 150 MHz 2.3 dB, @ 450 MHz 4.7 dB. Accepts PL-259 connectors.
ORDER # R3203

19258B RG8X – Single shield, 95% bare copper. Foam polyethylene dielectric. Black, UV resistant PVC jacket usable from –40 to +80 degrees Celsius. 80% velocity factor. Frequency attenuation per 100 ft @ 30 MHz 2.0 dB, @ 150 MHz 4.7 dB, @ 450 MHz 8.6 dB. Accepts PL-259 connectors when used with UG176 reducer.
ORDER # R3204

9913FX### Flexible "9913 style" RG8/U coax. Prebuilt cables with PL-259's available in lengths of 150, 100, 50, 25, 15, and 6 feet.

ORDER # R3211 -150'
ORDER # R3212 -100'
ORDER # R3213 -50'
ORDER # R3214 -25'
ORDER # R3215 -15'
ORDER # R3216 -6'

19258C### RG8X coax. Prebuilt cables with PL-259's. clear jacketed. .available in lengths of 100, 50, and 25,feet with black jacket. 12, 6, and 3ft. with clear jacket.

ORDER # R3223 -100'
ORDER # R3224 -50'
ORDER # R3225 -25'
ORDER # R3226 -12'
ORDER # R3227 -6'
ORDER # R3228 -3'

18267C### RG213/U coax. Prebuilt cables with PL-259's available in lengths of 150, 100, 50, 25, 15, and 6 feet.

ORDER # R3217 -150'
ORDER # R3218 -100'
ORDER # R3219 -50'
ORDER # R3220 -25'
ORDER # R3221 -15'
ORDER # R3222 -6'

COAXIAL CABLE CONNECTORS AND ADAPTERS

Cable X-Perts 306 UHF female to BNC male adapter. Commonly used to adapt VHF handheld antenna connectors to coaxial cable equipped with PL-259.
ORDER # R3409

Cable X-Perts 6633S male "N" connectors. Suitable for VHF/UHF use, installable on 9913FX or RG213/U coaxial cables.
ORDER # R3407

Cable X-Perts SMA male to UHF female. Makes connections to VHF HT's equipped with SMA antenna connectors a snap for PL-259 equipped coaxial cables.
ORDER # R3411

Cable X-Perts 279108 BNC male 'crimp-on' connector. Fits RG8X coaxial cable. Commonly used for VHF handheld radios or QRP HF transceivers.
ORDER # R3408

Cable X-Perts 421 UHF female to RCA male adapter.
ORDER # R3410

ROTATOR AND CONTROL CABLES

We offer two Cable X-Perts multi-conductor cables suitable for rotator or switching control line use. Each are sold in multiples of 50 feet only.

1618 rotator cable – similar to Belden #9405. This is a 'heavy duty' rotator cable designed for very long runs and/or higher current capacity. 8 wire cable with 2 16 gauge and 6 18 gauge conductors. Black UV resistant PVC jacketing. 0.346 inch outer diameter.
ORDER # R3321

5971 rotator cable – similar to Belden #8448. Light gauge rotator cable acceptable for runs of less than 200 feet. 8 wire cable with 2 18 gauge and 6 22 gauge conductors. Black UV resistant PVC jacketing. 0.26 inch outer diameter.
ORDER # R3322

DIAMOND ANTENNAS

CP22E. The CP22E is a high-gain 2 meter monoband aluminum vertical antenna. 6.5 dB gain, encapsulated matching network for weather protection, Stainless steel mounting hardware. 144-148 MHz, UHF ('SO-239') connector, 200 watts power rating, 8.9 feet high. Element phasing 2 x 5/8 wave.
ORDER # R2103

X200A. High-gain fiberglass 2m./70cm. vertical antenna utilizing waterproof joint couplings and stainless steel hardware. 144-148 MHz and 440-450 MHz, 6.0/8.0 dBi gain, UHF ('SO-239') connector, 200 watts power rating, 8.3 feet high. Element phasing 2 x 5/8 wave on 2 meters, 4 x 5/8 wave on 70 cm.
ORDER # R2111

F22A. High-gain fiberglass 2 meter vertical antenna utilizing waterproof joint couplings and stainless steel hardware. 144-148 MHz, 6.7 dBi gain, UHF ('SO-239') connector, 200 watts power rating, 10.5 feet high. Element phasing 2 x 5/8 wave.
ORDER # R2104

X510MA. Very high-gain fiberglass 2m./70cm. vertical antenna utilizing waterproof joint couplings and stainless steel hardware. 144-148 MHz and 440-450 MHz, 8.3/11.7 dBi gain, UHF ('SO-239') connector, 200 watts power rating, 17.2 feet high. Element phasing 3 x 5/8 wave on 2 meters, 8 x 5/8 wave on 70 cm.
ORDER # R2112

X50A. High-gain fiberglass 2m./70cm. vertical antenna utilizing waterproof joint couplings and stainless steel hardware. 144-148 MHz and 440-450 MHz, 4.5/7.2 dBi gain, UHF ('SO-239') connector, 200 watts power rating, 5.6 feet high. Element phasing 3 x 1/4 wave on 2 meters, 3 x 5/8 wave on 70 cm.
ORDER # R2110

X3200A. High-gain fiberglass 2m/1.25m/70cm. vertical antenna utilizing waterproof joint couplings and stainless steel hardware. 146-148, 222-225, and 440-450 MHz, 6.0/7.8/8.0 dBi gain, UHF ('SO-239') connector, 200 watts power rating, 10.5 feet high. 3/4 wave on 2 meters, 3 x 5/8 wave on 1.25m, 3 x 5/8 wave on 70 cm.
ORDER # R2114

V2000A. High-gain fiberglass 6m/2m/70cm vertical antenna utilizing waterproof joint couplings and stainless steel hardware. 2.15/6.0/8.0 dBi gain, UHF ('SO-239') connector, 150 watts power rating, 8.3 feet high. Element phasing 1/4 wave on 6 meters, 2 x 5/8 wave on 2 meters, 4 x 5/8 wave on 70 cm.
ORDER # R2115

We Accept: VISA • Mastercard • Discover

DIAMOND ANTENNAS

Diamond "fold over": Select Diamond VHF and VHF/UHF mobile antennas incorporate a "fold over" feature which will allow lowering of an installed antenna without removing it from the mount (ideal for pulling a car into a garage with a mobile antenna installed). Simply pull directly upwards on the antenna, and fold over equipped antennas will separate from the mount and can be laid down horizontally without removing the antenna from the mount. Fold over point is 4 to 6 inches above the mounting point.

NR2C 144 MHz mobile antenna. UHF female connector for connection to mount. Diamond "fold over". 55 inches tall, 4.1 dB gain. 150 watts power rating. Silver colored.
ORDER # R2203

NR770HA 144/440 MHz mobile antenna. UHF female connector for connection to mount. Diamond "fold over". 40 inches tall, 3.0/5.5 dB gain. 200 watts power rating. Silver colored.
ORDER # R2211

NR770HB Same antenna as NR770HA, only black.
ORDER # R2212

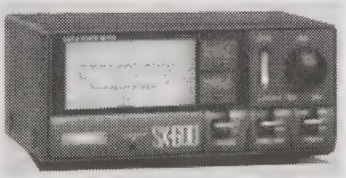
SG7500A 144/440 MHz mobile antenna. UHF female connector for connection to mount. Diamond "fold over". 41 inches tall, 4.1 dB gain. 150 watts power rating.
ORDER # R2213

DIAMOND ACCESSORIES:

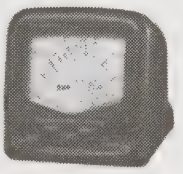
MX62M duplexer. 50 and 144 MHz. Allows connection of two separate 2 and 6 meter transceivers, or a dual band 50+144 MHz transceiver (like the Ten-Tec 526 VHF) to the same 50+144 MHz antenna. 600 watts PEP power rating. PL-259 connectors for connection to transceiver, SO-239 output connector to antenna. Insertion loss less than .3 dB.
ORDER # R2401

SX-200 1.8-200 MHz 200 watt peak reading SWR/power meter. Power metering selectable in three ranges of 5, 20, and 200 watts. SO-239 connectors. Illuminated meter (requires 12VDC @ 50 mA), switchable average or peak power output measurement, HWD 2"x6"x4", 2 pounds.
ORDER # R9000

SX-600 1.8-160 and 140-525 MHz 200 watt peak reading SWR/power meter. Power metering selectable in three ranges of 5, 20, and 200 watts. Directional couplers with switch and LED indicators to allow connection of two transceivers at the same time. SO-239 connectors. Illuminated meter (requires 12VDC @ 50 mA), switchable average or peak power output measurement, HWD 2"x6"x4", 2 pounds.
ORDER # R9001



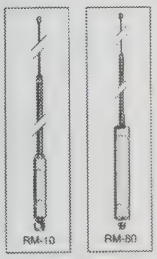
SX-20C 3.5-30, 50-54, 130-150 MHz 300 watt average reading wattmeter. Small, compact design ideal for use in mobile or limited space applications. Cross needle design allows for simultaneous monitoring of SWR and output power. 30 and 300 watt power switchable power output measuring scales.
ORDER # R9002



SX-40C Similar to SX-20C. 144-470 MHz only, 150 watts. Switchable 15 or 150 watt power output measuring scales.
ORDER # R9003

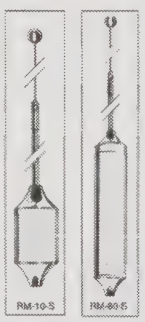
HUSTLER MOBILE ANTENNAS & ACCESSORIES

Standard resonators, 400 watt power rating.



Model	Band	Approx 2:1 SWR bandwidth
RM-10	10 meters	150-250 kHz
ORDER # R1202		
RM-15	15 meters	100-150 kHz
ORDER # R1204		
RM-20	20 meters	80-100 kHz
ORDER # R1206		
RM-40	40 meters	40-50 kHz
ORDER # R1208		
RM-75	75 meters	25-30 kHz
ORDER # R1210		
RM-80	80 meters	25-30 kHz
ORDER # R1212		

Super resonators. Rated for 1500 watts output power. Super resonators also feature wider bandwidth, particularly on 40, 75, and 80 meters.



Model	Band	Approx 2:1 SWR bandwidth
RM-10S	10 meters	250-400 kHz
ORDER # R1203		
RM-15S	15 meters	150-200 kHz
ORDER # R1205		
RM-20S	20 meters	100-150 kHz
ORDER # R1207		
RM-40S	40 meters	50-80 kHz
ORDER # R1209		
RM-75S	75 meters	50-60 kHz
ORDER # R1211		
RM-80S	80 meters	50-60 kHz
ORDER # R1213		

MO-3 Aluminum mounting mast, 54" high with white vinyl coating, to fit all Hustler resonators. Stainless steel base threaded to fit all Hustler and other 3/8" x 24 ball mounts.
ORDER # R1200

SSM-1 "Professional" ball mount and stainless steel spring for use with Hustler and other 3/8" x 24 thread antennas. Supplied with mounting hardware and cork pad.
ORDER # R2314

SSM-2 3/8 x 24" ball mount
ORDER # R2315

SSM-3 Stainless steel spring with coupling stud for base of 3/8" x 24 antennas
ORDER # R2316

QD-2 Quick disconnect for 3/8" x 24 thread antennas. Allows quick removal of antenna from mount without unscrewing connections.
ORDER # R2312

MO-4 Shortened aluminum mounting mast, 22" high, suitable for trunk or deck mounting, includes three new tip rods for resonator extension.
ORDER # R1201

Mobile antennas, accessories, hardware

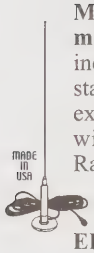
Hamstick mobile antennas. Two-piece monoband antennas consisting of a hollow fiberglass base section approximately 1/2" in diameter with the loading coil wound directly on the fiberglass and covered with PVS shrink tubing. Base fitting has 3/8" x 24 threads that fit most amateur radio mobile mounts. Top section is a tapered, tempered stainless steel whip that telescopes into the base section for frequency adjustment. The assembled, adjusted antenna will be approximately 7 feet long. High vehicle mounting is not a problem as the antenna is very resilient and will withstand abuse that would destroy metal antennas. No spring or guy wiring is required.

Model	Band	Approx 2:1 SWR bandwidth	Model	Band	Approx 2:1 SWR bandwidth
9110	10 meters	1 MHz	9120	20 meters	175 kHz
ORDER # R1214			**ORDER # R1218**		
9112	12 meters	entire band	9130	30 meters	entire band
ORDER # R1215			**ORDER # R1219**		
9115	15 meters	350 kHz	9140	40 meters	60 kHz
ORDER # R1216			**ORDER # R1220**		
9117	17 meters	entire band	9175	75 meters	10 kHz
ORDER # R1217			**ORDER # R1221**		

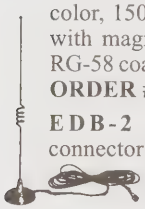
GP-10-2 144 MHz 1/4 wave base antenna. Economy priced unity gain 2 meter antenna. Aluminum mount and elements. Fits 1"-1.5" masts. All mounting hardware is included. Ready to connect to PL-259 equipped coax feedlines. 19 inches height.
ORDER # R2105

DBB-5 146/446 MHz base station antenna. Economy priced dual band VHF/UHF antenna. Aluminum construction. 40" height. 3.7/6.0 dB gain. 150 power rating. Ready to connect to PL-259 equipped coax feedlines. Similar to hamstick.
ORDER # R2113

9002 144 MHz 3/4 wave mobile antenna. Pre-tuned, 3 dB gain. 52 inches height. Stainless steel whip. Uses common 3/8" x 24 thread connection to mount. Rated to 500 watts.
ORDER # R2200



M-100 144 MHz 3/4 wave magnetic mount antenna. Economy priced. 49 inches height. 5/8 wave, 3 dB gain. Stiff stainless steel tapered whip. Equipped with extra strong 3" magnet, 15 ft. of RG-58 with PL-259 already attached to base. Rated to 150 watts.
ORDER # R2201

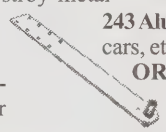


EDB-1 146/440 MHz mobile antenna, 19 inches tall. Economy priced. Black whip color, 150 watts power rating. Equipped with magnet at base of antenna, 15 feet RG-58 coax with PL-259 already installed.
ORDER # R2204

EDB-2 Same as EDB-1, except connector attached in place of PL-259
ORDER # R2205

OTG-270 Dual band 144/440 MHz 'on-glass' mounted antenna. Rated for 60 watts output power. Onlay 25.5" tall. Complete instructions, all mounting hardware. RG-58 coax and connectors are included.
ORDER # R2206

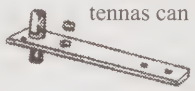
015A Trunk Mount Assembly mount. Attaches to underside edge of trunk lid by means of two set screws. Complete with 15' coax cable with connector installed and all hardware needed for mount. Ideal for use with Hamsticks and other smaller 3/8" x 24 thread mobile antennas.
ORDER # R2301



243 Aluminum flat bar mount. For fiberglass cars, etc. 3/8" x 24 mount. 14" inches long.
ORDER # R2300

276 4 bolt 3/8" mobile mount. Heavy duty 3/8" x 24 thread antenna mount. Installation piece can be mounted horizontally or vertically for vertical installation of antenna on vehicle. Ideal for outside rear view mirror mounting or conversion van rear ladder use. Includes 15 feet RG58 coax with PL-259 installed.
ORDER # R2302

276-NMO Same mount as 276, only for NMO antennas.
ORDER # R2309



901 rotatable dipole mount. This unique mount is a flat aluminum bar with 3/8" x 24 threads mounted on each side. Two 'Hamstick' antennas or similar mobile antennas can be connected to each side of the aluminum bar and mounted horizontally for use as a portable dipole antenna. Can be mounted on a mast up to 1.5" in diameter.
ORDER # R2303

BC-1 bumper clip for 3/8" x 24 thread mounting. Aluminum construction. Fully adjustable, accepts PL-259 connector directly connected to mount.
ORDER # R2304

372+ magnetic mount for UHF connector-equipped mobile antennas. For use with antenna like Comet and Diamond that are equipped with a UHF screw on connection. 5" heavy duty magnetic mount, equipped with connector for direct installation of antenna onto the base.Comes equipped with 15 feet of RG58 coax and PL259 installed.
ORDER # R2305

T+ no hole trunk lip mount. To fit antennas like Comet and Diamond that are equipped with a UHF screw on connection. Uses two set screws under bottom of trunk lid to mount antenna on rear trunk lid. Comes equipped with 15 feet of RG58 coax and PL259 installed.
ORDER # R2306

T-NMO no hole trunk lip mount for NMO antennas. Same as T+ mount, but for mobile antennas that use an NMO connection between antenna and mount.
ORDER # R2308

F-NMO 2 screw NMO mount. Two self tapping screws hold mount to body of vehicle – mounted inside the edge of trunk of vehicle. Screws cannot be seen and can be easily removed if necessary without visible alteration to vehicle.
ORDER # R2310

NMO-1 magnetic mount for NMO antennas. Very strong 3" diameter powder coated magnet. 15 feet of RG58 coax with PL-259 attached included. Fits VHF/UHF antennas requiring NMO connection.
ORDER # R2311

235 Barrel spring for 3/8" x 24 thread antennas up to 9 feet in length. Equipped with removable stud.
ORDER # R2317

075 Ball mount and spring. Can be mounted in a variety of directions via split ball assembly. All hardware and instructions included.
ORDER # R2319

RC-1 rain cap for NMO mounts. Disconnected your NMO antenna from the mount? Keep the NMO mount connection protected from rain with a screw-on rain cap.
ORDER # R2318

009HD quick disconnect. for 3/8" x 24 thread antennas. Quickly remove a 3/8" x 24 thread antenna from its mount with a QD connector. Simply push down and turn and the antenna oxide plated brass.
ORDER # R2413

D-2 2 meter HT antenna. Economy priced replacement 'rubber duck' antenna for 2 meter handheld transceivers. BNC connector, 12" tall.
ORDER # R2500

D-27 144/440 MHz HT antenna. Economy priced replacement 'rubber duck' antenna for 2m/70cm handheld transceivers. BNC connector, 12" tall.
ORDER # R2501

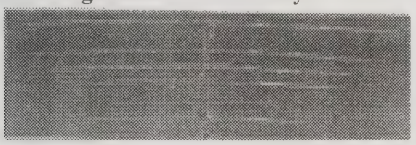
LDG ANTENNA TUNERS

AT-11MP The best design in desktop automatic antenna tuners. The LDG AT-11MP features a switched L-network design capable of handling 150 watts transmitter power. Quick, efficient operation, typical tuning time 3 seconds. Matches load impedances from 6 to 800 ohms (10:1 SWR). Dual cross needle metering allows simultaneous measurement of power output and SWR. SO-239 input and output connectors. Optional external balun allows tuning of random length, long wire, and other antenna systems. Measures HWD 2.5 x 9.5 x 8.25 inches, weight 3 pounds. Requires 13.8 VDC at 500 mA to operate.
ORDER # R4100

Z-11 QRP antenna tuner. The Z-11 QRP Autotuner is based on the AT-11 design with attention paid to reducing size and power consumption. Features a switched L-network design capable of handling up to 60 watts intermittent power use (30 watts continuous duty). Quick, efficient operation, typical tuning time 1.5 seconds. Matches load impedances from 6 to 800 ohms (10:1 SWR). Current consumption: 10 to 190 mA, 75 mA average. Zero current draw once tuned! Voltage requirement: 11 to 14 volts. SO-239 input and output connectors. Measures HWD 1.25 x 8.5 x 5 inches, weight 15 ounces.
ORDER # R4101

m^2 ANTENNAS

M2 Yagi antennas are the most ruggedly constructed, heavy duty Yagis available for amateur radio today. Superior performance makes these the #1 choice for monoband HF, VHF, and UHF antennas. Computer modeling and optimization assures the best possible performance from a given boom and element combination. All M2 antennas use machined aluminum element to boom mounts and feature stainless steel hardware through the antenna. All M2 antennas are ruggedized for maximum high wind survivability.



KT36XA. The result of hours spent perfecting the original classic KLM KT34XA through computer optimization and actual on-air tests. 5 of the 6 elements are resonant on each band (10, 15, and 20 meters). A dual driven element allows a beautiful flat match, broad gain, and front to back curves across all three bands.

DX includes: Hairpin type matching network couples included 5 kW balun to feedline.

10M4DX. 4 element 10 meter monoband Yagi.

12M4DX. 4 element 12 meter monoband Yagi.

15M4DX. 4 element 15 meter monoband Yagi.

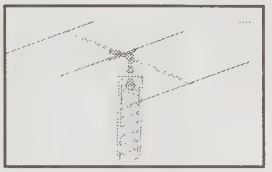
17M3DX. 3 element 17 meter monoband Yagi.

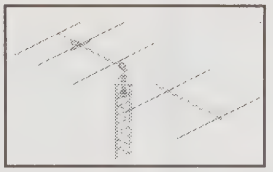
17M5DX. 5 element 17 meter monoband Yagi.

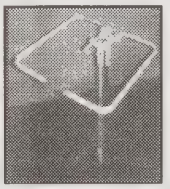
20M4DX. 4 element 20 meter monoband Yagi.

Please contact us for availability and shipping time for M^2 products. Other M^2 products not listed here are available through Ten-Tec. Please contact us with your needs.

m^2 UHF ANTENNAS







6 meter HO LOOP. An omnidirectional horizontally polarized loop. Wide bandwidth makes it immune to all weather conditions except heavy ice. 800 watts power handling capability. The 6 meter HO loop is 29.5 inches square with a wind loading area of just 0.1 square foot. 3/8" diameter tubing construction keeps it light but plenty rugged for mobile operation. SO-239 antenna connector. Weighs only 2 pounds.
ORDER # R2100

6M3 3 element 50 MHz Yagi antenna. Rugged computer optimized Yagi offering low wind load and excellent performance. Quick and easy to assemble, also great for mountain topping or grid square expeditions.
ORDER # R2000

6M5X 5 element 50 MHz Yagi antenna. Latest computer optimized version of M2's earlier 6M5 design. For use at the low end of the band for SSB and CW operation, but tuning instructions are also included if 52-54 MHz operation for FM is preferred.
ORDER # R2001

6M7JHV 7 element 50 MHz Yagi antenna. Mid-sized 7 element Yagi. Excellent gain. M2's most popular 6 meter Yagi.
ORDER # R2002

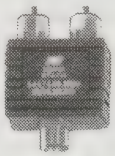
2 meter HO LOOP. An omnidirectional horizontally polarized loop. Wide bandwidth makes it immune to all weather conditions except heavy ice. 800 watts power handling capability. The 2 meter HO loop is 11.25 inches square with a wind loading area of less than 0.1 square foot. 3/8" diameter tubing construction keeps it light but plenty rugged for mobile operation. SO-239 antenna connector. Weighs less than 1 pound.
ORDER # R2101

2M7 7 element 144 MHz Yagi antenna. Computer optimized to outperform longer old design antennas. 2M7 covers the whole band with only slight performance degradation at the band edges. Side lobes are low – perfect for stacking.
ORDER # R2003

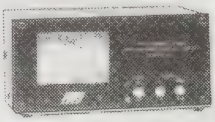
2M12 12 element 144 MHz Yagi antenna. Featuring the latest in computer techniques for optimization of pattern and gain. Sturdy boom construction requires no support trusses to keep antenna in an even plane. Superior performance, long term electrical and mechanical integrity.
ORDER # R2004

2M5WL 17 element 144 MHz Yagi antenna. Designed with the serious VHF DXer in mind. Provides maximum gain for minimum weight and windload yet is strong enough to survive 100 mph winds. Widely used in EME and large Tropo scatter arrays, also a great choice for a single yagi 144 MHz application.
ORDER # R2005

MFJ 916. 2m/440 MHz duplexer. For use with dual band 2m/440 transceiver to connect to a single 2m/440 MHz antenna from a transceiver with separate antenna connections for each band. 50 ohm ports, 200 watts power rating.
ORDER # R2402

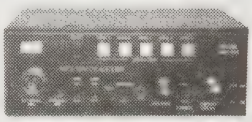


MFJ 815B SWR/power meter rated to 2000 watts. Large 3 inch cross-needle meter for simultaneous reading of forward power and SWR. Switchable power scales of 200 and 2000 watts. SO-239 connectors. Meter lamp requires 12 VDC.
ORDER # R9004



MFJ 564B Deluxe iambic paddles. Similar in style and construction to Bencher paddles. Tension/contact spacing adjustments, heavy base, non-skid feet. Black base.
ORDER # R9103

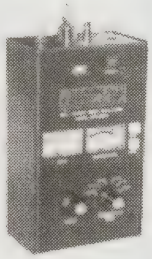
MFJ 434 "Contest" voice keyer. Microprocessor controlled. 5 memories for a total of 75 seconds of messaging. EEPROM used for memory storage, no backup batteries required. Can be remotely or computer controlled. Built-in speaker/amp formonitoring of stored messages. Can also be used to record receive audio off the air.
ORDER # R9105



MFJ 1910 Telescoping antenna support mast. Weighs just 3.3 pounds, collapses to 3.8 feet long. Pull out sections twist lock together, mast extends to 33 feet high! Put up wire antennas in portable locations in no time. Black, UV resistant super strong fiberglass construction.
ORDER # R3107

MFJ 295 HT speaker/mics. Small speaker/mics for handheld transceivers. Available for
ORDER # R9401 Icom (I)
ORDER # R9402 Kenwood (K)
ORDER # R9400 Yaesu (Y)
handheld VHF/UHF transceivers.

MFJ 259B SWR analyzer. The ultimate shack accessory? Reads SWR, complex RF impedance, coax cable loss, return loss, inductance, capacitance, etc. Side by side meters plus digital frequency readout. Extremely useful for antenna adjustments. SO-239 connector for direct connection of coax to 259B. Portable, battery powered. 1.8-170 MHz.
ORDER # R9500

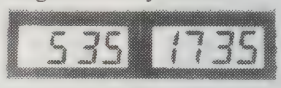


MFJ 1315 Accessory power supply for MFJ 259B. Operate your MFJ 259B from 110 VAC.
ORDER # R9602

MFJ 105C 24 hour analog wall clock. 24 hour quartz movement 12 inch black face, white numerals. Gold colored hour, minute and second hands.
ORDER # R9510

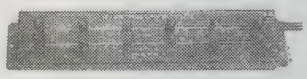
MFJ 107B 24 hour UTC clock. Digital LCD readout. 5/8" high digits. Solid brushed aluminum frame, long life battery included.
ORDER # R9511

MFJ 108B dual LCD clocks with separate 24 and 12 hour displays. Read UTC and local time simultaneously. 5/8" digits. Mounted in brushed aluminum frame with sloped face for easy viewing. Long life battery included.
ORDER # R9512



MFJ 1116 DC power distribution panel. Connects to your 13.8 VDC power supply terminals to provide 6 connection points for various equipment. 15 amp total max. rating. Similar to MFJ 1112, but includes on/off power LED, power switch, and 0–25 VDC voltmeter.
ORDER # R9601

MFJ 1112 Bare-bones DC distribution panel. Connects to your 13.8 VDC power supply terminals to provide 6 connection points for various accessory equipment. 15 amp total max. rating.
ORDER # R9600



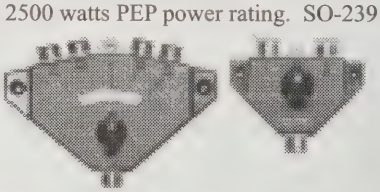
MFJ 260C 300 watt HF/VHF dummy load. Air cooled 50 ohm non-inductive dummy load. 300 watts for 30 seconds. Derating curve to 5 minutes. SWR 1:1 to 30 MHz, below 1.5:1 to 650 MHz. SO-239 antenna connector.
ORDER # R9610

MFJ 264 1500 watt HF/VHF/UHF dry dummy load. Air cooled 50 ohm non-inductive dummy load. 100 watts for 10 minutes. 1500 watts for up to 10 seconds. SWR below 1.3:1 to 650 MHz. SO-239 antenna connector.
ORDER # R9611

MFJ 392 Headphones. For amateur radio and shortwave listening use. Padded headband and ear cushion design. Works in mono or stereo mode. 100-24000 Hz frequency response. 16 ohms impedance.
ORDER # R9620

MFJ 281 ClearTone speaker. Designed to improve intelligibility of CW and SSB communications in the 600 to 4000 Hz range while reducing undesirable noise. Handles 8 watts, 8 ohm impedance.
ORDER # R9630

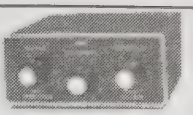
MFJ 1704 Four position coax switch. Center ground position. Replaceable lightning surge protector. 2500 watts PEP power rating. SO-239 connectors.
ORDER # R9206



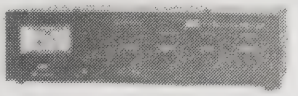
MFJ 1702C Two position coax switch. Center ground position. Unused terminal automatically grounded. Less than 0.2 dB insertion loss. SO-239 connectors.
ORDER # R9602

We Accept: VISA • Mastercard • Discover

MFJ - ANTENNA TUNERS



MFJ 901B Basic "T" network antenna tuner. 200 watts PEP. 4:1 balun for balanced line built-in. SO-239 input and output connectors for coax fed antennas. Two variable capacitors, 12 step tapped inductor. No metering. HWD 2.5 x 5 x 6 inches.
ORDER # R4102

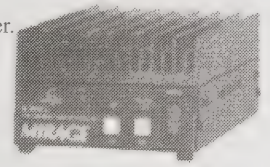


MFJ 941E Cross-needle metered "T" network antenna tuner. 300 watts PEP. 4:1 balun for balanced line built-in. SO-239 input and output connectors for coax fed antennas. Two variable capacitors, 12 step tapped inductor. Lighted cross-needle meter (requires 12 VDC) allows reading of SWR and forward power simultaneously. Antenna switching built-in. HWD 2.75 x 10.625 x 7 inches.
ORDER # R4103

MFJ 949E Deluxe 300 watt antenna tuner. Cross-needle metered "T" network antenna tuner. 300 watts PEP. 4:1 balun for balanced line built-in. SO-239 input and output connectors for coax fed antennas. Two variable capacitors, 12 step tapped inductor. Lighted cross-needle meter (requires 12 VDC) allows reading of SWR and forward power simultaneously. Antenna switching built-in. Built-in 300 watt dummy load. HWD 3.5 x 10.5 x 7 inches.
ORDER # R4104

MFJ 969 300 watt roller inductor antenna tuner. 1.8-50 MHz. Peak reading lighted cross-needle meter. 300 watts PEP. 4:1 balun for balanced line built-in. SO-239 input and output connectors for coax fed antennas. Two variable capacitors, air wound roller inductor. "T" network. Built-in 300 watt dummy load. Antenna switching built-in. HWD 3.5 x 9.5 x 10.5 inches.
ORDER # R4105

MIRAGE



A1015G 50 MHz linear amplifier. 10 watts input for 150 watts output. Ideal accessory for the Ten-Tec 526 VHF multi-mode transceiver.
ORDER # R4002

B1016G 144 MHz linear amplifier. 10 watts input for 160 watts output. Ideal accessory for the Ten-Tec 526 VHF multi-mode transceiver.
ORDER # R4003

B2518G 144 MHz linear amplifier. 25 watts input for 160 watts output. Ideal accessory for the Ten-Tec 526 VHF multi-mode transceiver.
ORDER # R4004

COMET VHF/UHF ANTENNAS

CA-ABC 22A 2m base antenna. Dual 5/8 wave design. 6.5 dB gain. 200 watts power rating. Aluminum construction. Total height 9.5 feet. SO-239 connector.
ORDER # R2102

GP-3 144/440 MHz base antenna. Fiberglass construction. 4.5/7.2 dB gain. 200 watts power rating. Total height 5' 11", weight 3 pounds. SO-239 connector.
ORDER # R2106

GP-6 144/440 MHz base antenna. Fiberglass construction. 6.5/9.0 dB gain. 200 watts power rating. Total height 10' 5", weight 4 pounds. SO-239 connector.
ORDER # R2107

GP-9 144/440 MHz base antenna. Fiberglass construction. 8.5/11.9 dB gain. 200 watts power rating. Total height 17' 8", weight 6 pounds. SO-239 connector.
ORDER # R2108

GP-15 50/144/440 MHz base antenna. Fiberglass construction. 3/6.2/8.6 dB gain. 200 watts power rating. Total height 7' 11", weight 3 pounds. SO-239 connector.
ORDER # R2109

B10-NMO NMO mount 144/440 MHz mobile antenna. Small, compact coil design. 12" high. 50 watts power rating. Unity gain. Black painted.
ORDER # R2207

B20-NMO NMO mount 144/440 MHz mobile antenna. Compact coil design. 30" high. 50 watts power rating. 2.15/5.0 dB gain. Black painted.
ORDER # R2208

SBB-5NMO NMO mount 144/440 MHz mobile antenna. 38" high. 120 watts power rating. 3.0/5.5 dB gain. Black painted
ORDER # R2209

SBB-7NMO NMO mount 144/440 MHz mobile antenna. 55" high. 70watts power rating. 4.5/7.0 dB gain. Black painted.
ORDER # R2210

BNC-24 144/440 MHz "Superflex" HT antenna. 17" high. Extremely thin taper wound antenna, highly flexible. Black. BNC connector for attachment to handheld transceivers.
ORDER # R2502

SBB25-NMO NMO mount 144 MHz mobile antenna. 4.1 dB gain. 100 watts power rating. Total height 52".
ORDER # R2202

MALDOL
UHF ANTENNAS

AS-20 144/440 MHz "Superflex" HT antenna. 8.5" high. Extremely thin taper wound antenna, highly flexible. SMA connector for attachment to handheld transceivers.
ORDER # R2503

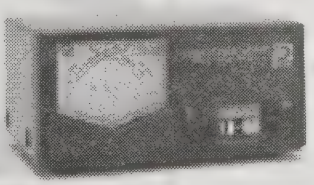
MH-209A same as MH-209, with SMA connector.
ORDER # R2506

MH-209 144/440 MHz. Very low profile small HT antenna, 3" high. Black. BNC connector for attachment to handheld transceivers.
ORDER # R2505

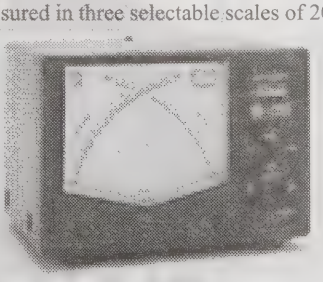
AS-30 144/440 MHz "Superflex" HT antenna. 15" high. Extremely thin taper wound antenna, highly flexible. SMA connector for attachment to handheld transceivers.
ORDER # R2504

DAIWA
POWER/SWR METERS

CN101 HF/VHF 1500 watt peak reading power and SWR meter. 1.8-150 MHz, 1500 watts. Power output measured in three selectable scales of 15, 150, and 1500 watts. Cross-needle metering allows for simultaneous metering of power output and SWR. Selectable peak of average reading power.
ORDER # R9005

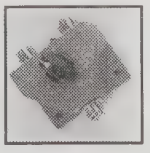


CN801H HF/VHF 2000 watt peak reading power and SWR meter. 1.8-200 MHz, 2000 watts. Power output measured in three selectable scales of 20, 200, and 2000 watts. Cross-needle metering allows for simultaneous metering of power output and SWR. Selectable peak of average reading power.
ORDER # R9006



COAX SWITCHES

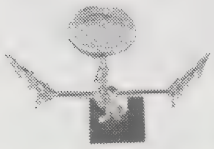
CS-201A 2 position coax switch. SO-239 style input and output connectors. 0-600 MHz. 1500 watts power rating.



PRECISION

Model 1133 Pencil solder iron with holder. 30 watt soldering pencil with small metal stand.
ORDER # R9300

Model 1134A Wire cutter, stripper, and crimping tool. 8" long. Stripping holes for 6 different sizes of insulated wire. Wire cutter. Crimping tool at tip.
ORDER # R9301



Model 3108 Soldering "helping hands" station. Acts as a "third hand" while soldering. Two 2" alligator clips and a magnifying glass on a heavy metal base to hold your soldering project steady.
ORDER # R9303

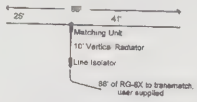
Model 3110 Soldering "helping hands" station. Like model 3108, but also includes a wire soldering iron holder attached to base.
ORDER # R9302

RADIO WORKS

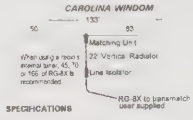
ANTENNAS AND ANTENNA ACCESSORIES

Carolina Windom 40, 80, and 160 models. The Carolina Windom's radiation pattern is different from simple dipoles and other similar antennas. Its unique combination of horizontal and vertical radiation components account for the performance the outclasses its competitors. The secret of the Carolina Windom antenna is its vertical radiator, which functions as both a matching stub and an active element of the antenna. A transmatch will be required for full coverage of all bands.

Carolina Windom 40. 10-40 meters. 66 foot antenna, fed off center with 25 feet of wire on one side of the feedpoint and 41 feet on the other. 10 foot vertical radiating section. Line isolation balun included. Requires 86' feet of 50 ohm coaxial cable as feedline.
ORDER # R1125



Carolina Windom 80. 10-80 meters. 133 foot antenna, fed off center with 83 feet of wire on one side of the feedpoint and 50 feet on the opposite side. 22 foot vertical radiating section. Line isolation balun included. Requires 50 ohm coaxial cable as feedline.
ORDER # R1126

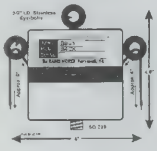


Carolina Windom 160. 10-160 meters. 265 foot antenna, fed off center with 182 feet of wire on one side of the feedpoint and 83 feet on the opposite side. 22 foot vertical radiating section. Line isolation balun included. Requires 70 or 166 feet of 50 ohm coaxial cable as feedline.
ORDER # R1127

B1-2K 1:1 current balun. 1500 watts power rating. Eye bolts on each side for connection of wire antenna to balun. Top eye bolt for connection of rope for center support. SO-239 style connector on bottom for direct connection of PL-259 equipped coax cable. Stainless steel hardware.
ORDER # R3001

B1-5K 1:1 current balun. 5000 watts power rating. Eye bolts on each side for connection of wire antenna to balun. Top eye bolt for connection of rope for center support. SO-239 style connector on bottom for direct connection of PL-259 equipped coax cable. Stainless steel hardware.
ORDER # R3002

B4-2KX 4:1 current balun. 1500+ watt power rating. Eye bolts on each side for connection of wire antenna to balun. Top eye bolt for connection of rope for center support. SO-239 style connector on bottom for direct connection of PL-259 equipped coax cable. Stainless steel hardware. Useful for off center fed dipoles, etc.
ORDER # R3003



T-4 and T-4G line isolation baluns. Good for isolating ground loop problems. Used to isolate feedline from antenna and prevent coax shield from acting as a ground radial. 4000 watt power rating. T-4 and T-4G are identical, except T-4G also has a 6" strap connected to the ground side for easy connection of radials at the feedpoint of an antenna or to other needed ground connections.
ORDER # R3004 T-4
ORDER # R3005 T-4G

R9900 1/2 inch inner diameter snap-on chokes. Snap-on ferrite beads that can be added or removed as necessary to isolate RF problems in the shack. 1/2 inch inner diameter is large enough to be clamped over large coax like 9913 and RG213/U, or can be used for wrapping multiple turns of smaller wire through a single ferrite core.
ORDER # R9900

WGA HEADSETS AND ACCESSORIES

WGA has been selling high quality headset/boom microphone combinations for aircraft and amateur radio use for a number of years. WGA headset/boom mics come pre-wired with a 4 pin microphone connector attached for 'plug and play' connection to Ten-Tec transceivers. Can be user-modified for use with other transceivers. Made in USA.

TR-2000. The TR-2000 is a high quality headset/boom mike combo featuring an electret condenser noise-cancelling microphone. Spring loaded flexible boom on microphone attached to left earpiece. Padded top headphone rail. Over-the-ear headphone pieces to prevent ear pain from headphones squashing ears back against the head.
ORDER # R9621

PTT-2000 and FT-2000. As supplied, the TR-2000 has no built-in TR switching. It can be used 'as is' for VOX operation, but for PTT operation the use of a hand or foot switch must be employed. The PTT-2000 is a small hand-held PTT switch that plugs into a jack already wired onto the mic jack of the TR-2000. FT-2000 is a footswitch that can be connected to a PTT closure to ground on the back of your HF transceiver, or to the same jack on the mic plug of the TR-2000 that accepts the PTT-2000.
ORDER # R9622 PTT-2000
ORDER # R9623 FT-2000

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Fax: (865) 428-4483
Repair Dept.: (865) 428-0364
e-mail: sales@tentec.com
web site: http://www.tentec.com

TEN-TEC INC
1185 DOLLY PARTON PARKWAY, SEVIERVILLE, TENNESSEE 37862
615-453-7172

AMATEUR PRODUCTS PRICE SCHEDULE

Effective September 1, 1993

MODEL	DESCRIPTION	Shp. Wt lbs/Kg	FACTORY DIRECT PRICE
216	500 Hz 6 Pole FSK Filter, 9 MHz (for 562 / 563 narrow position; 546)	1/0.45	69.00
217	500 Hz 8 Pole Ladder Filter, 9 MHz (for 562 / 563 narrow position; 546)	1/0.45	69.00
218	1.8 KHz 8 Pole Ladder Filter, 9 MHz (for 562 / 563 narrow position; 546)	1/0.45	69.00
219	250 Hz 6 Pole Ladder Filter, 9 MHz (for 562 / 563 narrow position; 546)	1/0.45	69.00
220	2.4 KHz 8 Pole Ladder Filter, 9 MHz (for 562 / 563 narrow position; 546)	1/0.45	69.00
236	Remote Control Cable for connecting Models 562, 563 or 585 to either a Model 253 or a Model 420	1/0.45	49.00
238	2 KW Antenna Tuner/SWR Bridge (1.8 -30 MHz)	14/6.6	379.00
239	300 Watt Dummy Load	1/0.45	27.95
240KW	1.5 KW Dry Dummy Load	8/3.6	259.00
253	1.5 KW Automatic Antenna Coupler (1.8 - 30 MHz)	13/5.9	995.00
254	200 W Antenna Tuner / SWR Bridge (1.8 - 30 MHz)	6/2.7	189.00
256	FM Transceive Module for Models 562/585	1/0.45	59.00
257	Voice Synthesizer for Models 562/563/585/586	1/0.45	79.00
258	RS-232 Interface for Model 585 only	1/0.45	59.00
259	Universal ALC Annunciator	1/0.45	34.00
264	236 Expansion Cable for connecting Model 253/420 combination to 562/563/ 585/586	1/0.45	32.00
268	Remote Control Cable, 536 to 420 or 253	1/0.45	32.00
269	QSK Linear Switching Cable, 536 to 420, 422 or 425	1/0.45	16.00
282	250 Hz 6 Pole Ladder Filter, 6.3 MHz	1/0.45	69.00
285	500 Hz 6 Pole Ladder Filter, 6.3 MHz	1/0.45	69.00
288	1.8 KHz 8 Pole Ladder Filter, 6.3 MHz	1/0.45	69.00
290	Step Attenuator, 5 Watt maximum input, for Model 535	1/0.45	49.00
291	200 Watt Antenna Tuner	4/1.8	89.00
293	Mobile Mount for 535/536	4/1.8	35.00
296	Mobile Mount for 555	3/1.35	15.00
297	Noise Blanker for 555	1/0.45	19.50
300	Remote Control Extension Cable, 12 FT., for Model 9423, if needed	1/0.45	45.00
301	Remote Frequency Tuning Control, for Model 562 or 563	3/1.35	75.00
303	Fan Kit for Model 536 Key Down Modes	5/2.3	25.00
305	RS-232 Serial Level converter for 535, 536 or 563	2/0.90	48.00
306	Plug adaptor, 4-pin power supplies to 2-pin 535 or 536	1/0.45	3.90
420	HERCULES II Linear Amplifier 500 W output,Solid State No Tune, 1.8 -23 MHz,13.5Vdc.	21/9.5	1295.00
420E	HERCULES II Linear Amplifier 500 W output,Solid State No Tune, 1.8-30 MHz,13.5 Vdc.(Export only)	21/9.5	1295.00
422	CENTURION Linear Amplifier 1.0 KW output, 1.8-23 MHz, with built-in Power Supply	65/29.5	1695.00
422WO	CENTURION Linear Amplifier 1.0 KW output, 1.8-23 MHz, built-in P. S., without tubes	60/27.2	1395.00
422E	CENTURION Linear Amplifier 1.0 KW output, 1.8-30MHz, built-in Pwr. Supply (Export Only)	65/29.5	1695.00
422EWO	CENTURION Linear Amplifier 1.0 KW output, 1.8-30 MHz, built-in P.S.,w/o tubes (Export Only)	60/27.2	1395.00
425	TITAN Linear Amplifier 1.5 KW output, 1.8-23 MHz, with Pwr. Supply (UPS Shippable, 3 boxes)	82/37.3	2995.00
425E	TITAN Linear Amplifier 1.5 KW output, 1.8-30 MHz, with Pwr. Supply (Export Only)	82/37.3	2995.00
535	ARGONAUT II, QRP General Coverage HF Transceiver, 5 W,SSB/CW/FM , 0.1-30 MHz	12/6.9	1295.00
536	DELTA II, G.C. HF Transceiver,100W,SSB/CW/FM , 0.1-30 MHz	17/7.7	1395.00
555	SCOUT HF Transceiver, 50W, SSB/CW, with 1 Band Module, others available	9/4.05	495.00
563	OMNI VI HF Transceiver, 100 W,SSB/CW/FSK/FM , 9 Band, DSP	25/11.4	2285.00
586	PARAGON II, G.C. HF Transceiver, 100 W, SSB/CW/FSK/AM/FM	25/11.4	2125.00
607	Single Paddle Assembly for 555/563	3/1.35	39.00
700A	Handheld Mic., Coiled Cord and 1/4 in. Connector (540,545,546, 580)	1/0.45	39.95
700C	Handheld Mic., Coiled Cord and 4 Pin Connector (535,536,561,562,555,563,585,586)	1/0.45	39.95
705	Desk Mic, Coiled Cord and 4 Pin Connector (536,561,562,555,563,585,586)	2/0.90	79.95
705A	Desk Mic, Coiled Cord and 1/4 in. Connector (540,545,546,580)	2/0.90	79.95

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MODEL	DESCRIPTION	Shp. Wt lbs/Kg	FACTORY DIRECT PRICE
801	160M Band Module for Model 555 SCOUT	1/0.45	25.00
802	80M Band Module for Model 555 SCOUT	1/0.45	25.00
803	40M Band Module for Model 555 SCOUT	1/0.45	25.00
804	30M Band Module for Model 555 SCOUT	1/0.45	25.00
805	20M Band Module for Model 555 SCOUT	1/0.45	25.00
806	17M Band Module for Model 555 SCOUT	1/0.45	25.00
807	15M Band Module for Model 555 SCOUT	1/0.45	25.00
808	12M Band Module for Model 555 SCOUT	1/0.45	25.00
809	10M Band Module for Model 555 SCOUT, 28.0 - 29.0 MHz	1/0.45	25.00
936	Power Supply, 115-230 VAC, 13.8 VDC, 22A for Model 536 DELTA II	18/8.2	220.00
937	Power Supply, 115 VAC Only, 13.8VDC, 11A inter., 7A cont for Model 555 SCOUT	14/6.6	79.00
961	Power Supply, 115/230 VAC, 13.8VDC, 22 A, built-in Spkr for 561,562,563,585,586.	21/9.5	275.00
1140	DC Circuit Breaker, for any 100 Watt Rig	1/0.45	17.95
2991	Extra 450 mAH Battery Pack, for Model 2591/TT920	1/0.45	43.00
2994	Extra 14 Hour Wall Charger — 115 V/230 V, for Model 2591 / TT920	1/0.45	20.00
3101	Replacement Top Section Stinger, 42" Long	2/.90	9.00
3101L	Replacement Top Section Stinger, 49" Long	2/.90	9.00
4010	Mobile 10 Meter Antenna 72" High	2/.90	34.00
4012	Mobile 12 Meter Antenna 72" High	2/.90	34.00
4015	Mobile 15 Meter Antenna 72" High	2/.90	34.00
4017	Mobile 17 Meter Antenna 72" High	2/.90	34.00
4020	Mobile 20 Meter Antenna 72" High	2/.90	34.00
4030	Mobile 30 Meter Antenna 72" High	2/.90	37.00
5060	TVI Highpass Filter	1/0.45	16.00
5061	Lowpass RF Filter, 1.5 KW Continuous	2/.90	79.00
9420	Power Supply for HERCULES II and Exciter 230 VAC, 13.5 Vdc. @ 100 A. (Motor Frt.)	70/31.8 *	749.00
9421	Spare DC Power Connector, for Model 420	1/0.45	8.50
9422	DC Power Pigtail, for Model 420 Mobile Installation	1/0.45	20.00
9423	Remote Control Head with 12 FT. Cable, for Model 420	3/1.35	135.00
23-227	Variable Capacitor, 1-207 pF @ 1kv, as used in Model 254	1/0.45	21.00
35057	4 Pin Microphone Connector	1/0.45	2.50
80-402	Tapped Inductor, 47 steps, 0.1-20 µH, as used in Model 254	2/0.9	24.00
80-572	Spare, 4 Pin DC Connector	1/0.45	1.50
80573	2 Pin DC Power Connector (555,535,536)	1/0.45	1.50
80-858	Variable Capacitor, 40-500 pF @ 3.5kv, as used in Model 238	2/0.9	58.00
80-858-1	Variable Capacitor, 40-800 pF@3.5kv, as used in Model 425	2/0.9	75.00
81-040	Roller Inductor, 0.1-19 µH, silver plated, as used in Model 238	2/0.9	62.00
86034-66	DC 2 Pin Cable as used with 535,536	1/0.45	5.00
86055	DC 4 Pin Cable as used with 563,585,586	1/0.45	5.00
86067	DC Cable for Model 555 SCOUT only	1/0.45	5.00
RM-238	Rack mount kit, Model 238 antenna tuner	2/0.9	24.00
RM-253	Rack mount kit, Antenna Coupler 253	2/0.9	24.00
RM-420	Rack mount kit, Hercules II 420	2/0.9	24.00
RM-425	Rack mount kit, Titan 425	2/0.9	24.00
RM-500	Rack mount kit, 562/585/563/586	2/0.9	24.00
RM-P0175-19	1-3/4" Blank Panel	1/0.45	6.00
RM-P0700-19	7" Blank Panel	2/0.9	15.00
RM-19-1750	19" Cabinet with 17-1/2" opening, with side mounted hand grips. ...	35/15.9	225.00

PAYMENT: We accept VISA, MASTERCARD, and DISCOVER. Please provide complete name, account number and expiration date. Money Orders, Cashiers Check and Personal Checks are also accepted. Please note personal checks may require up to 10 days to clear before shipment is made. TN. residents must add 8-1/2% sales tax. Sorry, no COD shipments.

* SHIPPING: Most shipments are made by UPS Surface or Parcel Post. Other services available by quotation. Federal Express requires COD on shipping charges only. To calculate your shipping/handling/insurance charge, total the shipping weight (listed next to price) for each item ordered and reference the chart below. NOTE: Model 9420 must be shipped by truck, call for shipping charges.

Total Shipment Weight

A - Under 3 lbs. C - 10-19 lbs. E - 35-69 lbs.
B - 3-9 lbs. D - 20-34 lbs. F - 70-100 lbs.

Location	A	B	C	D	E	F
Continental US	4.50	7.50	13.50	17.00	29.00	60.00
Alaska, Hawaii	9.00	14.00	30.00	52.00	80.00	130.00
Canada	9.00	14.00	30.00	45.00	60.00	75.00

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This price list is effective September 1, 1993

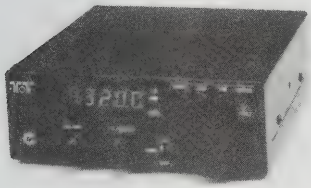
T-KIT Catalog
B2001

T-KIT

A Division of **TEN-TEC**, Inc.

Manufacturer of AMERICA'S BEST
Amateur Radio Transceivers

NEW! Model 1254
100 kHz - 30 MHz
Receiver, page 3



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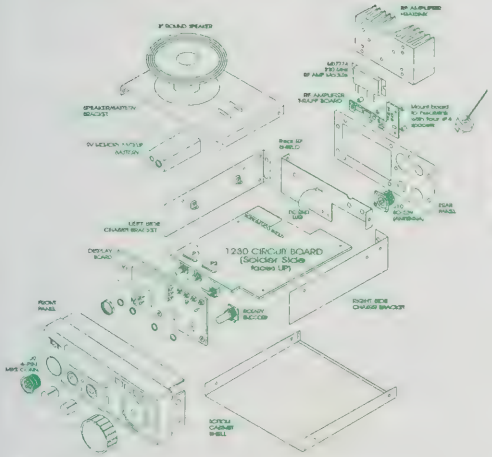
T-KIT by TEN-TEC

Today's proven standard in ham radio kit building



T-KIT

TEN-TEC, Inc.
1185 Dolly Parton Parkway, Sevierville, TN 37862-3710
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While the ham/electronics world had been lamenting the grand old days of kit-building, the TEN-TEC team of hams, engineers and technicians got to work to bring those days back to you!

TEN-TEC is the RIGHT company to bring you the very best in electronic kit-building using today's top technologies. We have 30 years of experience with the rapid changes in ham radio, and we stand today as the primary USA manufacturer of amateur transceivers . . . from the world-class Omni VI and DSP Pegasus to the affordability of our take-anywhere "Scout." We manufacture enclosures, hardware, and even transformers in our own plant and we have a legendary reputation for customer support. In fact, we're the only major transceiver manufacturer which encourages you to open up your rig and fix problems yourself with our friendly help.

We've watched the kit industry with interest since our beginning. In fact, when he was president of Electro-Voice™, our chairman, Al Kahn, lent a hand and a big load of parts to some Michigan pals starting up a post-War company they named Heathkit™.

*The 100 people in the TEN-TEC manufacturing plant promise you these three things absolutely **essential** to any electronics kit product:*

1. **Quality engineering design**
2. **Careful packing of kit parts**
3. **Clear, informative instruction manuals**

Become our partner in this adventure of continuing the USA kit-building tradition -- by following directions attentively, using that ever-proud American craftsmanship as you build!

WELCOME TO TODAY'S WORLD OF KIT-BUILDING
from just some of us here at TEN-TEC . . .

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. . . America's Best!

Enjoy TEN-TEC Receiver Quality with Digital Tuning for Worldwide AM-SSB-CW, from 100 kHz to 30 MHz!

T-KIT Shortwave Receiver Model 1254: only $195 and the smoothest kit-building experience you can imagine!

The grand tradition of receiver kit building is no longer confined to direct-conversion or regenerative designs! The Model 1254 combines the satisfaction of a serious kit building experience with the performance features expected in a modern HF receiver at a very competitive price. You will build a true dual-conversion superhet with a microprocessor-controlled frequency synthesizer. Building this receiver yourself gives you the assurance that you can maintain it in perfect working order.

BUILDING SKILL LEVEL: Intermediate ● BUILDING TIME: 20 to 25 hours

- **Frequency coverage:** 100 kHz to 30 MHz ● **Modes:** AM, SSB/CW
- **Main Tuning:** Normal or Fast tuning (2.5 kHz SSB, 5.0 kHz AM, or 100 kHz steps for either mode)
- **"Clarifier" Control:** for ±1.5 kHz SSB/CW fine tuning between 2.5 kHz steps.
- **Front panel controls:** On/off switch, Tuning, Volume, Clarifier, Mode Select, Memory Write (MW), VFO/Memory tuning select (V/M), Tuning Rate Select (SPEED)
- **Memories:** 15 programmable memories
- **Circuit:** Synthesized 45-75 MHz local oscillator ● 45 MHz first I-F, 455 kHz second I-F
- **Sensitivity:** AM mode: 2.5 μV for 10 dB SNR at 30% modulation
  SSB/CW mode: 0.5 μV for 10 dB SNR ● **Selectivity:** 4 kHz @ -6 dB
- **Frequency/Memory Display:** 6-digit green LED with mode indicators
- **Power supply:** 12-15 VDC, 250 mA current consumption with no signal present; 15VDC @800 mA wall transformer supply *included* with kit.
- **Antenna connector:** 50 ohm input, RCA-style phono jack
- **Audio:** 1.5 watts audio output to internal speaker, plus 1/8" stereo phone jack for standard personal headphones or direct feed to 4-8 ohm external speaker, data interface or both.
- **Semiconductors:** 10 IC's, 26 transistors, 16 diodes
- **Compact Size:** 2.25" x 6.5" x 6.5" (HWD)
- **Construction:** Steel clamshell case, aluminum chassis, custom-molded front panel.

EASY ALIGNMENT!

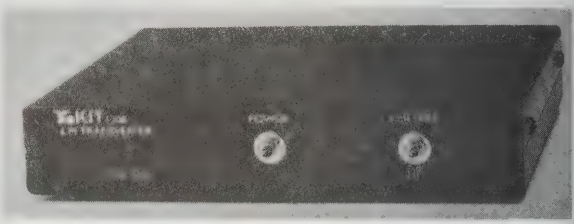
Yesteryear's serious superhet receivers involved many dozens of alignment points, usually requiring professional service equipment, often scaring away the casual hobbyist. To "align" your state-of-the-art Model 1254, you need only a VOM and your ear! During kit construction, we provide **Progress Tests** for each of the 6 Assembly Phases. The receiver generates its own built-in 45 MHz test signal.

T-KIT Model 1254 Shortwave Receiver KIT: $195.00
(Includes all parts, DC power supply, Kit Manual, SWL Guide and Log booklet)

Let's Get Together and REPOSSESS 6 Meters!

How long can FOUR WHOLE MEGAHERTZ of precious semi-HF VHF spectrum just sit there for us hams if so few of us have gear to even try out this fascinating 6 Meter band? The T-KIT 1208 Transverter lets new Technicians and oldtimers alike repossess 6 Meters at a VERY nice price!

SSB-CW-FM **6-Meter Transverter**



Add the excitement of the 50 MHz amateur band so easily to ANY modern ham transceiver, including all those 20-Meter-only QRP rigs. A transverter lets you transmit as well as receive on 6 Meters, using the precision digital tuning, available modes, memories and other features of your HF transceiver. It's simple: 14.000 MHz on your display or dial is 50.000 MHz. To operate SSB on 50.200 MHz, simply switch the 1208 to 6 Meters, tune to 14.200, keep transceiver RF output under 5 watts, and just go for it! The 8 Watts RF output is generous power during good band openings and for local communications and repeaters.

Features:

- ❑ Use with any transceiver capable of 3-5 watts on 20 meters
- ❑ Extremely simple hookup and operation
- ❑ Low-noise 50-54 MHz receiving input
- ❑ Easy front-panel switching between HF and 6M antennas
- ❑ Fast, silent RF-sensing PIN diode T-R switching for QSK and data communication

Specifications and Operating Requirements: 12-15VDC at 3.0 amperes external DC power requirement • RF output at 51 MHz: 8 watts typical • standard 20M transceiver required for basic 50.000-50.350 MHz Beacon/CW/SSB operation • FM operation requires FM transmit/receive capability of a general coverage transceiver capable of 14-16 MHz operation, with repeater offsets being a function of the transceiver's VFO memory system • Receive 50-54 MHz; transmit 50-52 MHz (transmitting above 52 MHz is not recommended) • the 14 MHz transceiver RF output MUST be attenuated to 5 watts or less.

T-KIT No. 1208, Six-Meter Transverter Kit, $109.00
No. 1208A, Assembled/Tested 6M Transverter, $159.00

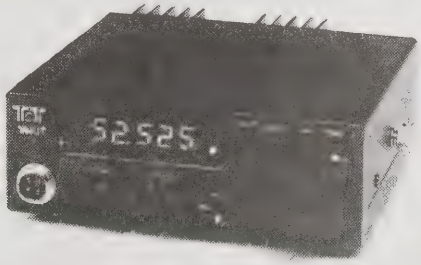
More Ways to explore 6 Meters

T-KIT Model 1209 Transverter: 8 watts RF output on 6 meters from your 2 meter rig or HT

Newly-licensed hams: explore your operating privileges beyond 2 Meters VERY economically! Operate 50-54 MHz on any mode covered by your 144-148 MHz rig or HT. With the same general features and specifications as our popular 1208 6 Meter Transverter (see page 4), the Model 1209 was designed for those regions where 6M FM repeaters take the load off the busy 2M systems. And you may find yourself making cross-country simplex QSO's during those exciting 6M band openings.

Just think: only $304 gives you BOTH 2 meters and 6 meters if you build and use the 1220 Transceiver and 1209 Transverter!
(See page 10)

T-KIT No. 1209, Six-Meter Transverter KIT, $109.00
No. 1209A, factory assembled, $159.00



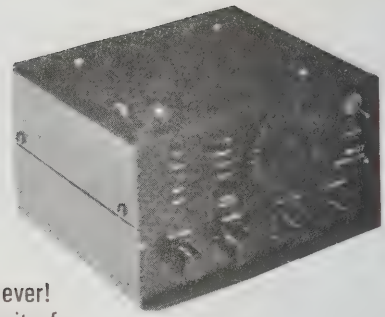
T-KIT Model 1260 6 Meter FM TRANSCEIVER for only $195!

- **15 programmable memories**
- **ready for 6M's varying transmit offset schemes**
- **microprocessor-controlled**
- **complete with microphone, internal speaker and mobile bracket**

Read about the Model 1220 2M transceiver (pages 10-11) and imagine the same great-looking rig ready for easy and fun 6M FM repeater or simplex action, no matter what kind of transmit offset scheme is employed! FCC regulations currently prohibit the sale of an add-on amplifier, but our many happy transverter owners can tell you that a few watts on 6M is a blast!

T-KIT Model 1260 5 Watt 6 meter Transceiver KIT, $195.00.

9-Band Shortwave Receiver



The classic "first radio kit" is back better than ever! We've combined the very same audio output circuit of TEN-TEC transceivers with a modern FET design for classic regenerative SWL receiving plus one-button electronic bandswitching. The result is an easy-to-build shortwave radio that's fun and interesting for the whole family. No alignment required. Simply install all parts as directed, put together the high-quality mechanical parts, and start enjoying the magic of shortwave radio. Explore 9 smooth-tuning SWL and ham bands from 1.8 to 22 MHz at the push of a ⏏ button! Receives AM, SSB, CW and all those other magical shortwave sounds.

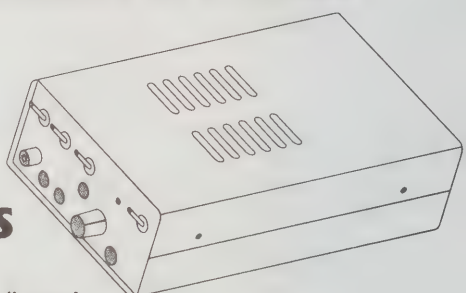
FEATURES: Front-panel RF gain, Volume, Regeneration, Tuning **and Fine-Tuning** controls • generous audio from Signetics TDA2611A to built-in speaker or stereo phone jack • Electronic switching of 9 tuning ranges • rugged, rounded-clamshell steel enclosure • simple, clear linear logging scale for large tuning knob • requires 8 alkaline C cells or external 12VDC.

KIT No. 1253, $69.00

On a tight budget with a club of eager radio builders? Our 4-Band Model 1054 Module Board Kit has comparable features for only $24! See page 14.

Listen to the Mysterious Sounds of ENERGY!

Hi-Sensitivity Audio Amplifier with Experiments



A wonderful project kit for experimenters of all ages!

Build a rugged, versatile, portable utility amplifier (for which you'll find dozens of practical uses over the years). Then, begin to explore the fascinating world of the unique sounds made by all kinds of energy — from lightning whistlers on the other side of the world to the stress noise of a bending paperclip. Listen to radar, to light waves, to your computer. Listen to nearby radio signals on any frequency, any mode. In addition to the kit assembly manual, you get a fascinating project booklet based on experiments by USAF Engineer Calvin R. Graf as your guide to adventures with the sounds of Energy. Amp;ifier features hi and low Z inputs, switchable preamp, 1.5W output. Requires 8 "AA" batteries or external 12-15 VDC.

NOTE: The kit includes accessories for many of the energy listening experiments. You will need 1x2" wood (furring strips) and wire to build the 4' loop antenna explained in the project booklet.

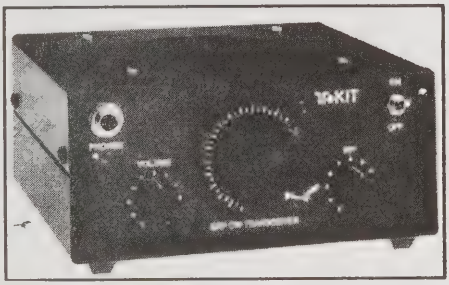
T-KIT No. 1252, $44.00

Take your favorite CW band anywhere for only $95!

TEN-TEC began in 1968 with the release of very inexpensive "QRP" transceivers. We thought it would be fun to revisit those roots. We explored **today's** RF technology and components to see just how inexpensive, compact and simple a ***quality*** QRP kit rig could be. The low price and great receiver design make these QSK VFO-controlled transceivers a smart choice for those times and moods when you want to try out a few watts of RF output. Get on the air from the beach, or a mountaintop, or your office or dorm room!

The T-KIT Family of QRP CW Transceivers now includes 15M!

T-KIT Model 1315 for **15 Meters**, $95.00
T-KIT Model 1320 for **20 Meters**, $95.00
T-KIT Model 1330 for **30 Meters**, $95.00
T-KIT Model 1340 for **40 Meters**, $95.00
T-KIT Model 1380 for **80 Meters**, $95.00



Frequency Coverage: VFO tuning of any 50 KHz segment of CW subband. Tuning range is selected during winding of one toroid in the VFO circuit.
Frequency Control: varactor tuned oscillator with potentiometer control. Temperature compensated LC components stabilize VFO.
RIT (receive incremental tuning): ±1.5 KHz.
Antenna: 50 ohm unbalanced, SO-239 connector.
Power requirement: 12-14VDC, 35 mA. receive (no signal), 80 mA receive (S-9 signal), 800 mA on transmit.
Construction: Black texture painted clamshell-type steel top and bottom, aluminum chassis, subpanel and heatsink. One 3.5"X5" double-sided circuit board
Board-mounted Components: 216 including 4 IC's, 19 transistors, 13 diodes.
Front Panel Controls: main tuning, RIT, volume, DC on-off toggle.
Connectors: front panel 1/4" stereo phone jack; rear panel SO-239 for antenna, 3 RCA jacks for key, DC input, accessory DC output.
Dimensions: HWD 2.75"x6"x6". **Weight:** 2.25 lbs./1.02 kg.

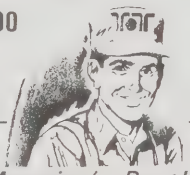
TRANSMITTER:
- **RF Output:** 3 watts typical, no external adjustment ● **T/R Switching:** solid state, full break-in
- **CW offset and sidetone:** Adjustable 400-1000 Hz sidetone automatically tracks offset frequency. Sinewave sidetone has internal level adjustment.

RECEIVER:
- **Type:** single conversion superhet, JFET mixer ● **Sensitivity:** .25 μV typical for 10 dB S/N
- **Selectivity:** 4-pole crystal ladder filter (1 KHz nominal bandwidth)
- **AGC:** audio derived ● **IF frequency:** 11 MHz on 80 and 40 meter models; 14.32 MHz on 30 meter model; 6.14 MHz on 20 meter model.
- **Audio:** 300 mW @ 4 ohms, built-in 3" speaker

20/200 Watt **SWR Bridge & RF Wattmeter** for BOTH 1.8-30 MHz AND 144-148 MHz!

Build this top-quality station accessory that you'll use for a long, long time. Features easy-to-read meter, front panel switching of 20 or 200 watt ranges, HF or 2-Meters, sensitivity control, four SO-239 antenna and transmitter connectors, all housed in a rugged steel enclosure less likely to bounce at the mercy of RG-8 coax! Range: 1.8 to 30 MHz *plus* 2 Meters! Separate HF and VHF connectors let you leave the unit in-line with BOTH rigs. Convenient toggle switching between HF and VHF. This is your USE-ANYWHERE RF Power/SWR meter system!

T-KIT Model 1202 SWR Bridge Kit, $59.00

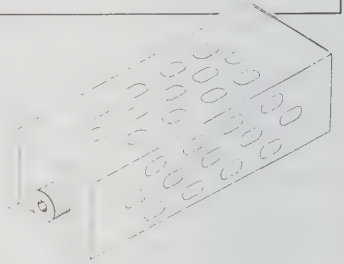


TEN-TEC . . . *America's Best!*

You have the common sense to know why TEN-TEC doesn't build into the cost of our radios the cost of giving away hats 'n stuff at hamfests. But, we're proud of the many requests we get for TEN-TEC caps, mugs, or other symbols of the made-in-USA pride that you share with the 100 folks at TEN-TEC. So, if you'd like our sharp-looking, top-quality *embroidered* all-weather cap (gray, with black/red design), it's yours for a few % over our cost! Thanks for joining the TEN-TEC team!
TEN-TEC embroidered cap, adjustable band, $10.00.

RF Dummy Load

50-Ohm, 300 Watts



"I know I SHOULD be using a dummy load for this test. Will this giant surplus resistor work? What's the impedance of this big old light bulb?"

YES, a dummy load is the least exciting of all radio tools. But, there are those times when it's the right tool for the job. Your complex transceiver suddenly acts like a QRP rig: is it the rig, the tuner or the antenna? Loading the rig directly into the 1203 Dummy Load will report the basic health of your transmitter section. Save $$ by building this easy kit yourself. With many common-sense uses, this is the boring accessory you'll really appreciate whenever you start to wonder what's going on with ANY transmitter setup. Good for HF and VHF. C'mon: get one!

T-KIT No. 1203 Dummy Load Kit, $29.00

2 Meters Getting Crowded? Discover 220 MHz Action!

T-KIT Model 1230 220 MHz FM Transceiver

Engineered specifically for the 222-225 MHz band, using integrated 220 MHz RF power module for simplified construction and alignment. Front-panel switching of 4-5 watts or 20 watts RF output. Shop around: the Model 1220 is the lowest-priced 220 MHz rig on the market with the features you need and expect. Microprocessor-controlled, 15 memories, tunes 221.890 - 225.200 MHz in 10 KHz steps, plus Memory Scan. General operating features similar to Models 1220 and 1260.

See next page for more details and specs on T-KIT VHF FM Transceivers.

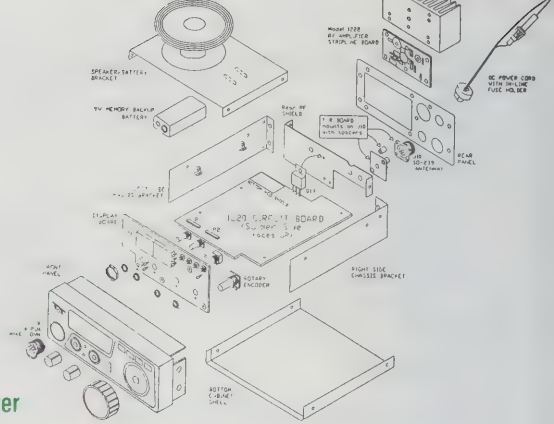
T-KIT Model 1230 20 Watt FM Transceiver Kit, $295.00
Includes microphone and mobile mounting bracket.

Compact RF Ground Counterpoise

At a fraction of the cost and size of other "artificial ground" gadgets, the T-KIT 1251 helps solve those annoying RFI/TVI and "hot chassis" problems caused by a lack of proper RF ground. Ideal for condo and travel situations where PVC plumbing makes classic waterpipe grounding schemes impossible, or if a good ground is too far away from the station. While NOT a substitute for a vertical's radial system or for the basic safety grounding required for all installations, it does provide a "tuned counterpoise" to satisfy the transmitter's need for a correct RF ground path.

T-KIT Model No. 1251, $59.00

Build your own 15-Memory 2-Meter FM Transceiver for only $195!



The Model 1220 FM/Data Transceiver shows just how serious T-KIT is about filling the big void in ham radio kit-building. Why pay hundreds more? You do NOT have to rely on imports for a 2-meter FM transceiver with the modern features which today's hams take for granted. And you won't have to settle for the stripped-down performance of other VHF kit transceivers. You'll learn from building it how to take care of it yourself. Priced like a second rig, good enough to be your only rig!

T-KIT Model 1220 Transceiver Features:

- ❑ Advanced microprocessor-controlled design
- ❑ Front-panel knob tuning of 143.500-148.500 MHz in 5 KHz **(or 2.5 KHz) steps**
- ❑ **15 Memories** store frequencies with repeater offsets **AND subaudible tones!**
- ❑ Store up to FIVE non-standard TX offsets (CAP, MARS, etc.)
- ❑ Bright 6-digit LED display resolves to 5 KHz channel tuning steps
- ❑ LED indicators for TX Offsets, Simplex, RX Busy, TX On-Air, CTCSS tone on
- ❑ Built-in speaker PLUS external speaker jack
- ❑ Optimized, standardized packet circuitry, standard DIN connector
- ❑ **Hand Microphone and Mobile Mount . . . BOTH INCLUDED!**
- ❑ Build it now for 5 Watts or 30 Watts, or upgrade to 30 Watts later

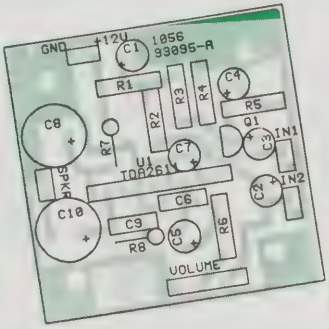
- ❑ Contemporary molded front panel and steel case are standard, not extra!
- ❑ Instantaneous, silent PIN diode T-R switching
- ❑ Full CTCSS subaudible TX tone set **BUILT-IN**, microprocessor-controlled

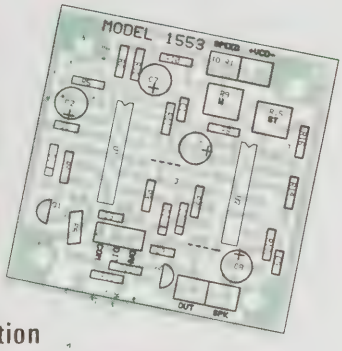
Model 1220 Typical Specifications: Sensitivity .2 μV for 12 dB SINAD ● Deviation ± 5 KHz ● Dynamic range: 70 dB (2 tone, 3rd order IMD @ 20 KHz from 146 MHz) ● Adjacent channel rejection: 70 dB (@ 20 KHz from 146 MHz).

T-KIT Model No. 1220 Transceiver Kit, 5 Watts RF Output. $195.00
No. 1222 30 Watt RF amplifier module kit for Model 1220 $84.00

For Creative Kit-Builders . . .

T-KIT MODULE BOARDS





As T-KIT continues the Tradition
of Heathkit, Knight, WRL, Layafette and those other grand kits
complete with all hardware and enclosure
there still is the other tradition of
simpler kits with PC-board, primary parts and instructions only,
designed for those who prefer to find their own kit-finishing hardware.
That's why we bring you T-KIT MODULE BOARDS,
the very best in "little kits" for careful budgets!

These "smaller" but carefully-engineered T-KIT boards
are for hams and experimenters who use their own hardware and ingenuity to custom-finish a project. You get the circuit board with all needed I/O pads, all board-mounted parts, a well-engineered circuit and the same high-quality step-by-step instruction manual that is the hallmark of all T-KITS.
Finish the job with your own switches, connectors and enclosure,
or get a great head-start with a T-KIT *Enclosure-PLUS* Hardware Pak
featuring TEN-TEC's easy-to-use blank aluminum boxes,
plus a useful assortment of finishing hardware and components.

See Pages 12-16:
T-KIT MODULE BOARDS . . . the very BEST in "Little Kits"!

❑ Transmatch Tuning Bridge

Have you ever wondered what good one of those $60-100 "R-X Noise Bridges" could do for YOUR station setup? Are you baffled by your antenna tuner or "transmatch"? The 1051 is easy to build and super-easy to use. No "R-X" controls, calibration or calculations needed. Just connect it between your rig and antenna tuner, set receiver to desired operating frequency, and adjust the antenna tuner until the distinctive *modulated pulses* (NOT just straight "noise"!) drop to an easily-recognized "null" indicating that the tuner offers a 50-ohm match to your transceiver -- with NO on-the-air nervous experimenting with the tuner controls!

T-KIT No. 1051, $17.00

Suggested Enclosure-Plus Pak, No. 1000A, $15.50

❑ Foxhunt "Beep-Beep" Transmitter (for FM Broadcast Band)

Here's a great gadget at a great price for clubs, classes, scout troops and packs, camps and family fun! Tune it to any quiet part of the 88-108 MHz FM band per FCC Part 15 rules, noticing its distinctive "beep-beep" modulation, and let the kids use their own FM portable radios to discover the basics of direction-finding. Hide it indoors on rainy days! Includes board-mounted on-off switch and 9V battery snap. Use several to demonstrate triangulation.

T-KIT No. 1059, $12.00.

❑ Budget Electronic Keyer

A classic circuit and a nice price make this a great project for beginners or for building into extra rigs. Includes speed control, weight control (rarely offered in "simple" CMOS circuits) and sidetone pitch control. A lot of keyer for the price, it features self-completing dits and dahs for standard single-lever keyer paddles. While not designed for iambic operation, the price and reliability make the 1553 a very nice introduction to electronic CW keying.

T-KIT No. 1553, $12.00

Suggested Enclosure-Plus Pak, No. 1000A, $15.50

(Also may be mounted inside TEN-TEC Keyer Paddle, Model 607, $39.00.)

T-KIT, a division of TEN-TEC, Inc.

1185 Dolly Parton Parkway • Sevierville, TN 37862 •

T-KIT Enclosure-*PLUS* Hardware Paks

With three sizes to fit all T-KIT Module Boards, these nifty Enclosure-PLUS Hardware Paks give you real choices for dressing up your small kit projects:

- ❑ Dig through and make good use of your own parts collection
- ❑ Shop at Radio Shack, local distributor or next hamfest
- ❑ Enjoy the practicality of a T-KIT **Enclosure-*PLUS*** Hardware Pak

ALL Enclosure-PLUS Hardware Paks include: TEN-TEC TP-series aluminum box suitable for your project, mechanical hardware, plus helpful toggle switches, knobs, etc. You may get more than needed for the one project: add the extra goodies to your parts drawers for your next T-KIT MODULE BOARD project!

Connectors: Since there are so many **different** hookup methods useable for RF, DC, audio, and other connections, we must leave it up to you (or your Radio Shack store, ham buddy or hamfest) to choose what's handiest for rear-panel hookups.

THREE Convenient T-KIT Enclosure-PLUS Hardware Pak sizes:

- ❑ T-KIT No. 1000A (standard), $15.50
  [TP19 box (2X4¾X4"), DPDT toggle, wire/mini-coax pak, knob, misc. hardware]
- ❑ T-KIT No. 1000B (medium), $19.50 [tops in value and general usefulness]
  [TP41 box (2¼X5½X4¼"), DPDT & SPDT, 3 knobs, wire/coax pak, hardware]
- ❑ T-KIT No. 1000C (deluxe), $22.50 [for 1056 receiver, similar projects.]
  [TP45 box (2¾X6½X5½"), SPDT, wire/coax/hardware, 5 knobs, 3" speaker]

❑ "Smart Squelch" Band Opening Alert

Also known as the DXer's "Integrating Squelch," this great circuit liberates your family from hiss, whines and other noises when your receiver is tuned for those unpredictable openings on any HF or VHF band that usually seems DEAD. This "integrating" squelch responds to the cumulative effect of several seconds of weak signal rather than to isolated noise bursts. Connect between rig and external speaker; no receiver modification required. You supply creative 12VDC alarm devices (piezo, chime, strobe light, etc.) Also may be used to add conventional squelch feature to older receivers, any mode. (Strong signals break squelch quickly.)

T-KIT No. 1064, $19.00

Suggested Enclosure-Plus Pak, No. 1000A, $15.50

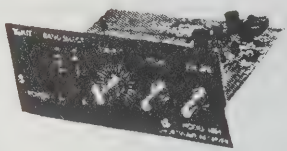
A New World of Budget-Priced Receiver Projects!

❑ Universal BFO for SWL Receivers

Got an old (or very new) AM-only shortwave radio with no CW-SSB capability? If you want to enjoy casual CW-SSB reception, this varactor-tuned 455 KHz oscillator may be built into larger receivers or else mounted in its own case and placed near your portable SWL radio. The on-board tuning control compensates for alignment variations from one receiver to another in addition to permitting fine-tuning of SSB/CW signals. Operates on 6 to 15 VDC.

T-KIT No. 1050, $9.00

Suggested Enclosure-Plus Pak, No. 1000A, $15.50



❑ Regenerative 4-Band SWL Receiver

(Kit INCLUDES drilled, painted, silkscreened aluminum front panel!)

Here it is: PROOF that the classic "first receiver" project need not be more expensive today than our favorite 1950's kits. In fact, this great little receiver beats the pants off those 3-tube radios with the big plug-in coils. Excellent for clubs, classes and family activities. Band coverage: 49 Meter SWL band, 40 Meter ham band, 31 Meter SWL band, plus exciting 12-15 MHz tuning for daytime shortwave listening, 20 Meter ham band and all those other magical shortwave sounds. The sharp-looking front panel gives the "real radio" look right away: dress up your project later with a case and knobs, and perhaps a speaker. You can enjoy the basic kit just by hooking up 9 to 12 volts DC, setting up a modest wire antenna (10 feet or more of hookup wire) and plugging in your own stereo headphones (1/8" plug). Features convenient push-button bandswitching, on-off switch, "on" LED, tuning, volume, regeneration control.

T-KIT No. 1054, $24.00

Suggested Enclosure-Plus Pak, No. 1000B, $19.50

Attention, Club Leaders! No. 1054C **T-KIT CLASS-Pak:**
Includes five 1054 Receiver Kits, Instructor's Notes, Spare-Parts Kit, $110.00.

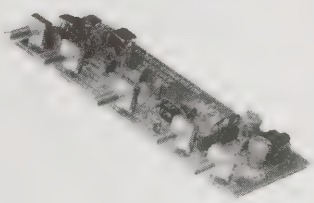
✓ NEW for 2001:
Model 1315 QRP Transceiver for 15 Meters!
See page 5

❑ "ANY BAND" Direct-Conversion SSB/CW Receiver

This is your *best buy, by far*, in a ham band direct conversion receiver kit. It has better audio and filtering than the others, and we supply the parts and instructions to let you build it for (or change it to) ANY band of your choice. That's Right: YOU choose the Band! Many hams KNOW that there are only minor coil and capacitor differences in the simple RF input and oscillator sections of a basic direct-conversion receiver. We give you ALL parts needed to build for your choice of 160, 80, 75, 40, 30, 20, 17, 15, 12 or 10 meters! Try out your own multi-band switching ideas. Start planning a budget-priced QRP transceiver that will really WORK!

Note to Beginners: Contrary to some advertising claims, a direct-conversion receiver is very good for CW/SSB but **cannot** provide very pleasant listening for shortwave AM broadcasts (BBC, Radio Moscow, VOA, etc.) For general listening, we suggest T-KIT Model No. 1054 or No. 1253.

Model 1056 Receiver Design Features:



- ❑ Signetics NE612 mixer-oscillator
- ❑ True varactor tuning (MV209)
- ❑ Zener diode regulation
- ❑ LM358 op amp bandpass filter
- ❑ Front-panel bandpass control
- ❑ Signetics TDA2611A audio amplifier IC
- ❑ Stereo jack for economical "Walkman" headphones
- ❑ Plenty of speaker audio
- ❑ **Separate "Bandset" and s-m-o-o-th 20 KHz "Bandspread" tuning controls!**
- ❑ RF gain control
- ❑ Provision for TX sidetone injection
- ❑ Provision for receiver audio muting during transmit
- ❑ Efficient 6"WX2½"D board layout: take your favorite ham band ANYWHERE!
- ❑ Jumper provision for separate DC supply to audio IC
- ❑ Operates on 12-15 VDC

T-KIT No. 1056, $29.00

Suggested Enclosure-Plus Pak, No. 1000C, $22.50

❑ Active Antenna for Receivers

If you've been curious about what an "Active" receiving antenna can or cannot do, without paying the $40-$100 cost typical of both kit and manufactured units, you will enjoy the experience of building, learning about and using this very simple, budget-priced kit. Just for fun, we carefully tested this little T-KIT 1552 Module board next to active antennas sold by Heath, MFJ, Ramsey. Wow: you'll get the performance without the price tag! Bring ANY HF receiver to life with the 1552 and a small length of wire, or a simple whip antenna! Compact 1.75" square board can be mounted inside receiver or in its own small box. Circuit includes gain control; operates on 6 to 15 VDC.

T-KIT No. 1552, $12.00

Suggested Enclosure-Plus Pak, No. 1000A, $15.50

❑ Universal Low-Noise Broadband DC to 1 GHz RF Preamp

You KNOW that every kit company sells some sort of broadband preamp for all purposes. If you want to try a broadband, untuned RF preamp on any receiver or scanner or other instrument, THIS one is your best buy! Excellent noise figure, gain and frequency coverage *at a BUDGET PRICE!* Up to 18.5 dB gain at 100 MHz. 17 dB gain typical at 500 MHz. Supply voltage: 8-14 VDC.
T-KIT No. 1001, $9.00

❑ Utility Audio Amplifier

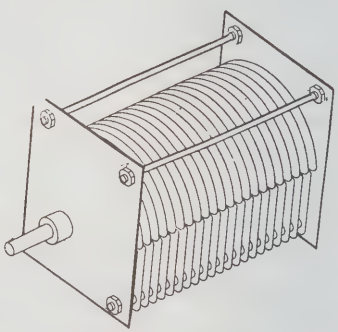
Need a quick, reliable, inexpensive audio amplifier stage for that homebrew project? This careful design *gives your project the very same audio output circuit that we use in today's TEN-TEC transceivers!* Enjoy 1.5 watts of low-distortion audio with no worry about motorboating and other unwanted oscillations. Includes optional preamp input for 10 dB gain. Important: this circuit is designed for 12-15 VDC.
T-KIT No. 1550, $10.00

❑ Microphone Speech Processor

While speech processing IS a standard feature of today's SSB transceivers, there's plenty of nice equipment at hamfest flea-markets which can benefit significantly from the addition of this proven speech processor circuit used in all of today's TEN-TEC transceivers. If there's room, build it into that older rig. Or, design it into that audio console you've been planning, or just use a neat TEN-TEC box!
T-KIT No. 1551, $12.00
Suggested Enclosure-Plus Pak, No. 1000A, $15.50

YES! You can build a . . .

High-Power Variable Capacitor



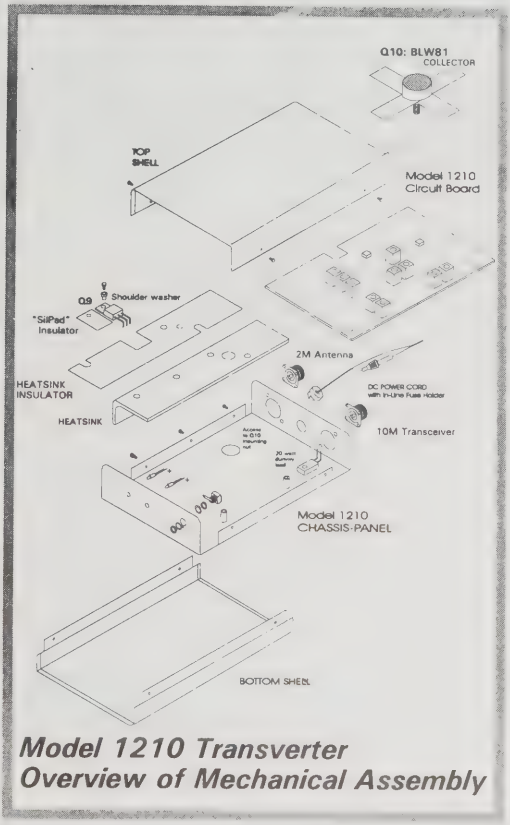
❑ 40-500 pF
❑ Rated 3.5 KV

What? Me BUILD a capacitor? Air-variable capacitors cost **$$$** these days ***because of all the hand labor of putting them together.*** If you'd like to spend part of an evening reliving those grand old Erector Set days, save money by assembling your own high-power variables from our top-quality factory-ware. Build the same tuning capacitors used in world-class TEN-TEC 1.5KW RF amplifiers and tuners. Great for all hi-power homebrew projects, including experimental loop antennas.

T-KIT No. 1207, $49.00 (TEN-TEC assembled No. 80-858, $74.00.)

Operate 2 Meters in Any Mode with Your 10 Meter Transceiver!

For only $139, add 2 meters to any HF transceiver. Ideal new use for those idle 10 meter mobile rigs. Full 10 watts RF output. ALC-controlled 10M input handles power range of 4 to 20 watts. Solid-state T-R switching. Engineered from scratch for optimized 10M-2M conversion performance. Compact: 1.5"H x 5"W x 8"D.



Model 1210 Transverter
Overview of Mechanical Assembly

Model 1210 Specifications:

- **Frequency Coverage:** 144-148 MHz band, typically 144-145.7 MHz, based on 28-29.7 MHz tuning range of most 10 meter transceivers. 116 MHz local oscillator.
- **Power requirement:** 12-14VDC, 100 mA. receive, 600 mA in transmit with no drive, 2.0A on transmit at 10 watts output.
- **Construction:** Black texture painted clamshell-type steel top and bottom, aluminum panel/chassis and heatsink. One 5.5"X3.75" double-sided circuit board.
- **Semiconductors:** 2 IC's, 13 transistors, 25 diodes. RF final: BLW81.

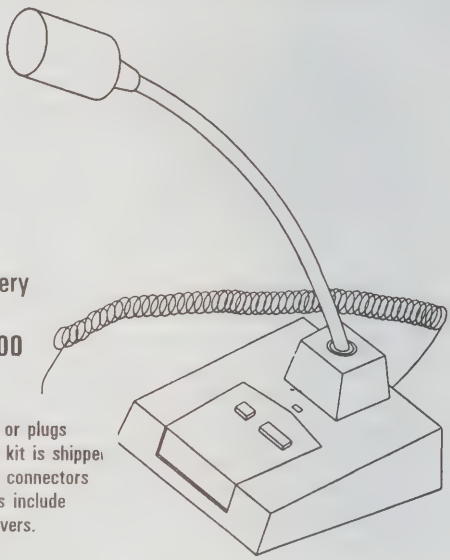
TRANSMIT:
- **RF Output:** 10 watts maximum on CW and FM, 10 watts PEP on SSB.
- **T/R Switching:** solid state, RF sensing.
- Output Power Adjustment Range: 2 to 10 watts.
- **Spurs and Harmonics:** Greater than -56 dBc at 10 watts out.
- **Standard TX Hang Time:** Approximately 1 second.
- **Input Drive:** Less than 0.5 watts input to key TX mode. 4 watts input for 10 watts output. Input drive level is ALC controlled between 4 and 20 watts. Input SWR less than 1.5:1.

RECEIVE:
- **Noise figure:** less than 2 dB. ● **Conversion Gain:** Approximately 17 dB.
- **Image Rejection:** Greater than 60 dB. ● **Input Intercept:** -6.5 dBm typical.

T-KIT Model 1210 10M-2M Transverter KIT, $139.00.
Model 1210A Factory Assembled, $239.00

Communications Desk Microphone

If you want your station to have the same quality of desk mike expected by demanding TEN-TEC transceiver users, at a great price savings, here's your chance to build and learn all about a proven desk-style comnunications mike that will complement any HF or VHF transceiver.



T-KIT 1201 Mike Features:

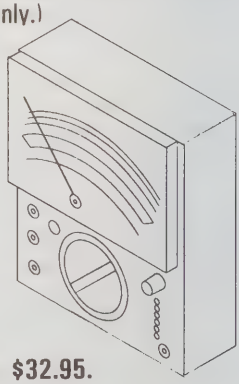
- ❑ Choice of PTT or VOX operation
- ❑ Electronic lock and release of PTT
- ❑ Sensitive op-amp preamplifier
- ❑ LED "on" indicator
- ❑ Type: Electret Condenser
- ❑ Sensitivity: -52 dBV/1 μbar
- ❑ Uses 7-14 VDC from rig or internal 9V battery

T-KIT No. 1201 Desk Microphone Kit, $59.00
TEN-TEC Model 705 (factory wired/tested), $79.95

MIKE CONNECTORS: Because various styles of connectors or plugs are used in ham and audio equipment, the 1201 microphone kit is shipped WITH shielded coil cable but less connector. Most standard connectors are stocked by RadioShack™. Current TEN-TEC microphones include 4-pin connector standard for all TEN-TEC and T-KIT transceivers.
TEN-TEC No. 35057, 4-pin microphone connector, $3.00

Economical Multitester

We found this great value in a taut band, mirrored scale VOM with handy extra features. We were so impressed with its performance that we decided to offer it for sale to our kit customers. (Not a kit: factory-assembled only.)



- ❑ 20,000 ohms/volt
- ❑ DC volts: 0.1, 0.5, 2.5, 10, 50, 250, 1000
- ❑ DC current: 50μA, 2.5, 25, 250 mA, 10A
- ❑ Resistance to 20 megohms
- ❑ AC volts: 10, 50, 250, 1000
- ❑ Audible continuity checker
- ❑ hFE transistor testing
- ❑ Built-in Battery Tester
- ❑ Rear panel pop-out stand
- ❑ 4"W X 6"H X 1.5"D

TEN-TEC Model 1130 Multitester, factory-assembled, $32.95.

Order Kits by PHONE • FAX • MAIL!

Minimum Order: $15.00 (plus shipping)
Inquiries or Information: 1-865-453-7172
8:00 AM - 5:30 PM Eastern/EDT, Monday-Friday
Credit Card Orders: 1-800-833-7373 (Orders ONLY, please!)
FAX orders or inquiries: 1-865-428-4483

☐ Check here if this is your first order of any kind DIRECT from TEN-TEC.

NAME _____ Callsign _____ *

STREET ADDRESS _____
UPS requires STREET address for delivery

CITY _____ STATE ____ ZIP _____

DAYTIME phone or fax number: ( ) _____
* Amateur Radio license required to use transmit-capable T-KIT products.

Quantity	T-KIT No.	Description	Weight	Price Each	Amount

Total Weight of order: _____ **Lbs. TOTAL:** $_____
SHIPPING per Charts: _____
Tennessee Customers must add 8.5% State tax: _____
TOTAL PAYMENT ENCLOSED / credit card authorization: _____

SHIPPING (see Weight Chart):

Total order weight:	1-4 lbs.	5-10 lbs.	11-20 lbs.	Over 20 lbs:
48 States	$6.00	$9.00	$12.00	*Please call*
AK,HI, Canada	$15.00	$19.00	$23.00	*for quote*

48 States shipped via UPS surface or U.S. Mail. AK and HI shipped 2nd Day Federal Express. Canada shipped by air mail unless UPS specifically requested.

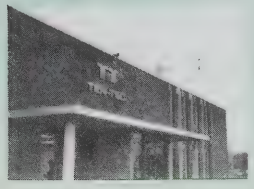
PAYMENT BY:
☐ Check ☐ Money Order ☐ VISA ☐ Mastercard ☐ Discover
Card No. _____ Expiration Date _____

1. All payments must be in U.S. Dollars (Sorry, NO C.O.D.)
2. Kit parts are warranted for one year to be free from manufacturing defect.
3. Any T-KIT may be examined, returned complete and UNASSEMBLED in fully-reuseable condition, within 30 days of shipment date, for full credit or refund, less original shipping/handling charge. Customer pays return shipping.

Visit our website: www.tentec.com

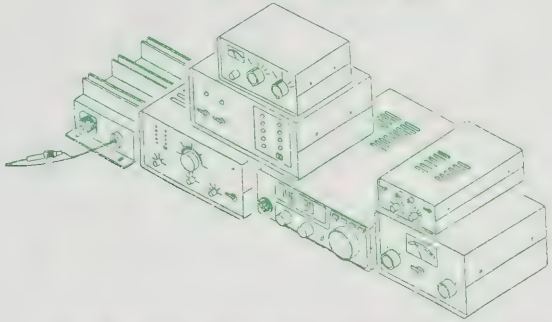
SHIPPING WEIGHTS

KIT	PAGE	LBS.
1000A	13	1
1000B	13	1
1000C	13	2
1001	13	1
1050	14	1
1051	12	1
1054	14	1
1054C	14	2
1056	15	1
1059	12	1
1061	14	1
1064	13	1
1130	18	2
1201	18	1
1202	8	3
1203	8	1
1207	16	2
1208	4	4
1208A	4	4
1209	5	4
1209A	5	4
1210	17	4
1210A	17	4
1220	10	5
1222	11	1
1230	9	5
1251	9	3
1252	6	3
1253	6	4
1254	3	5
1260	5	5
1320	7	4
1330	7	4
1340	7	4
1380	7	4
1550	16	1
1551	16	1
1552	15	1
1553	12	1



T-KIT
A Division of **TEN-TEC**, Inc.
1185 Dolly Parton Parkway
Sevierville, TN 37862-3710

Now, it's time for T-KITS!



While the Ham/Electronics World has been lamenting the grand old days of kit-building, the TEN-TEC team of hams, engineers and technicians has been working to bring those days back to you!

FIRST CLASS MAIL

TO:

The Ten-Tec RX-320 PC Radio

Reviewed by Joe Bottiglieri, AA1GW

Are you looking for a convenient way to keep tabs on current HF propagation conditions? Do you enjoy listening to shortwave broadcast and utility stations but can't always find the time away from your blasted computer to visit your primary receiver in the shack?

While the computer has quietly weaseled its way into our offices, dens and living rooms, your ham equipment, in spite of recent improvements in enclosure styling, is often relegated to a dark, lonely corner of our recreation rooms or basements.

A Virtual Visit to the Shack

The Ten-Tec RX-320, a very nicely featured PC-based shortwave (100 kHz to 30 MHz) receiver in an unobtrusive black box, might be just the item we need to help radio regain a foothold in our computer obsessed existences.

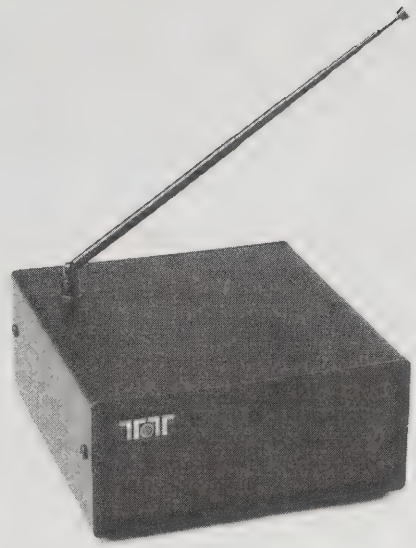
This little unit can hide out in a dusty corner or on a nearby shelf taking up little more space than that external zip drive you blew your ham equipment budget on last year. Connect it to the "time pirate" with the included 6-foot DB-9 cable through one of its COM ports (come on, you can spare just one!) and hook the included audio output cable to your sound card input, or use the unit's external speaker jack and a separate speaker. Screw in its little telescoping antenna (or better still, attach a decent antenna to its separate RCA external antenna connector), plug the wall-wart power supply into that already overloaded power strip, install the software for *Windows 3.1 or 95/98*, and you're surfing the *ether* again!

Now, as you sift through the latest pile of unsolicited e-mails or wander aimlessly through the links that resulted from the Internet search you started hours ago (*what was it I was looking for?*), you can simultaneously listen to the soothing sounds of actual human voices, sports or music on AM broadcast or shortwave, or tune in to the activity on an HF ham or utility frequency.

"Knobs" and "Buttons"

The control panel that appears on your monitor is visually reminiscent of the rapidly disappearing days when most consumer electronics had actual buttons and knobs you could feel with your fingertips. It just floats there on the opposite side of the glass, looking for all the world like the actual front panel of a tabletop radio, but just out of reach (see Figure 1).

Your mouse now acts as a cyberspace finger, allowing you to twiddle the tuning knob, press the virtual buttons and slide the big volume control. You can even tune around and control many features using keyboard commands. (Look Ma... no mouse!)



It's capable of AM, USB, LSB and CW reception, and there's DSP-based filtering that provides bandwidths of 500 Hz and 1.8, 2.5, 5 or 8 kHz. Tuning steps are selectable at 10 or 100 Hz, or 1, 5 or 10 kHz. The current settings for these are clearly shown in the virtual radio's display window.

Frequency is indicated in big yellow digits, and also on a nostalgic analog sliding frequency scale, harking back to Ten-Tec gear of old. There's a large analog style signal-strength meter with dual needles for instantaneous and peak readings that can be shown or hidden with a check box in the **OPTIONS** window. The meter scale is not calibrated in S units, but only provides an indication of relative signal strength. Additional settings in this same menu activate automatic mode sensitive tuning step size and filter selection, UTC/local time offset, CW pitch, audio output level for the sound card and a frequency display calibration adjustment.

Navigating

There are several ways you can tune to a desired frequency. You can use the mouse pointer to rotate the main tuning knob or drag the sliding frequency scale, or enter frequency digits directly from your keyboard. You can also use the keyboard's up and down arrow keys, or use the mouse to press frequency step or scroll buttons on either end of the sliding scale. Additional tuning methods are available from the memory and spectrum scope modes.

A button labeled **WORLD TIME** will bring up a window with keys to instantly tune WWV at 2.5, 5, 10 or 15 MHz, or CHU time broadcasts on 3.33, 7.335 or 14.670 MHz. I found this feature especially handy for making a quick check of propagation.

One of the obvious benefits of computer-based radio equipment is the virtually unlimited amount of storage space for frequency memories and related information. The RX-320's **MEMORIES** or **RECALL STATION** buttons bring up a memory window (see Figure 2). Ten-Tec includes a file with information for 25 popular shortwave broadcast stations on the program disk. This information is copied onto your hard drive when you initially install the software.

You can instantly tune to any station on the list by double-clicking on it, or with a single click and a press of the **TUNE** button. If you highlight a station and press the **EDIT** button, you'll bring up a "Station Information Sheet" (see Figure 3). This window includes fields for the station name (up to 30 alphanumeric characters), frequency, mode, filter setting, country, language and a large "notes" section. Additional buttons on the memory window allow you to **ADD** or **DELETE** entries. Three check boxes along the bottom of the window let you sort the listings alphabetically by station name or country, or in ascending frequency order. Press the **CLOSE** button to exit the memory window. The radio will be tuned to the selected station and its name will now appear in a small box on the left side of the front panel.

It's important to remember that memory information is retained in the computer. If you install the software on another computer and want to access stations you previously added to the list, you'll need to make a copy of your expanded *.rmf* file. You'll find this in the directory where you installed the radio software.

Scoping Things Out

One other neat feature is a multifunction spectrum scope (see Figure 4). You can adjust the limits of the sweep to seven different ranges from 3 kHz to 1.5 MHz. Press the **SWEEP** button and the receiver slowly tunes through the selected range plotting relative signal strength versus frequency. Audio is muted during this operation. When the sweep is complete, you can use a mouse cursor crosshair to determine the frequency and level of any point in the spectrum field; the values are instantly displayed at the lower edge. Double-click, and the radio will tune to that frequency, making investigating signal peaks easy.

Documentation and Updates

The 31-page "User's Manual" packed with the receiver devotes about 10 pages to

Bottom Line

If you're considering exploring shortwave or HF ham band listening for the first time, looking for a reasonably priced second receiver, or are simply searching for a cool new accessory to connect to your home, office or laptop computer, the RX-320 is an excellent choice.

instructions on connecting the unit to your computer, installing the software and basic operation. Once you've set up the connections and installed the program, a few minutes spent exploring the features and playing with the buttons is probably all the operating instructions you'll need. There is an extensive help menu with sections on operation and troubleshooting available from the tool bar on the main screen.

Table 2
Ten-Tec RX-320, serial number 07A10608

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency coverage: Receive, 0.1-30 MHz.[1]	As specified.
Power requirement: Receive, 0.5 A, 13.5-15 V dc.	Receive, 0.33 A. Tested at 13.8 V.
Modes of operation: SSB, CW, AM.	As specified.
Receiver	*Receiver Dynamic Testing*
SSB/CW sensitivity, 2.5 kHz bandwidth, 10 dB S+N/N: 0.3 μV.	Noise floor (MDS), 500 Hz filter: 1.0 MHz –117 dBm 3.5 MHz –133 dBm 14 MHz –134 dBm
AM sensitivity, 12 dB S+N/N, 1-kHz tone, 80% modulation: 0.64 μV.	10 dB (S+N)/N, 1-kHz tone, 30% modulation: 1.0 MHz 7.4 μV 3.8 MHz 1.36 μV
Blocking dynamic range: Not specified.	Blocking dynamic range, 500 Hz filter: 3.5 MHz 111 dB* 14 MHz 109 dB*
Two-tone, third-order IMD dynamic range: 90 dB.[2]	Two-tone, third-order IMD dynamic range, 500 Hz filter: 3.5 MHz 84 dB* 14 MHz 82 dB*
Third-order intercept: +10 dBm.[2]	3.5 MHz –7.4 dBm 14 MHz –10.7 dBm
Second-order intercept: Not specified.	–29 dBm.
S-meter sensitivity: Not specified.	Maximum indication at 14.2 MHz: 484 μV.
Receiver audio output: 1.0 W into 4 Ω, THD not specified.	2.9 W at 10% THD into 4 Ω.
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth): CW-N (500 Hz filter): 769-1250 Hz (481 Hz); CW-W: 794-3333 Hz (2539 Hz); USB: 118-2667 Hz (2549 Hz); LSB: 111-2667 Hz (2556 Hz); AM: 67-3793 Hz (3726 Hz).
Spurious rejection and image rejection: 60 dB.	First IF rejection, 14 MHz, 54 dB; image rejection, 14 MHz, 102 dB.

Size (HWD): 3.0×6.3×6.5 inches; weight, 2.5 pounds.

Note: Unless otherwise noted, all dynamic range measurements are taken at the ARRL Lab standard spacing of 20 kHz.

*Measurement was noise-limited at the value indicated.

[1]Specification table states "degraded performance below 1 MHz."

[2]Two-tone, third order IMD and Third-order intercept specifications were met. These figures are based on a 2.4 kHz bandwidth and 50 kHz spacing.

Most of the rest of the manual is an excellent *Introduction to Shortwave Listening* tutorial by Joseph J. Carr, K4IPV, with loads of information on shortwave and HF radio listening for the beginner. You'll find chapters with explanations of frequency and wavelength, bands, modes, World Time, propagation and antennas. A useful "What's on the Bands" section gives a short description of the type of activity you are likely to find in each of 39 separate frequency segments, together covering the entire range of the receiver.

During the course of this product review period, Ten-Tec released a new version of the control software. This update covered some minor bug fixes and added some additional features. Free updates are available for download from their web site: **http://www.tentec.com**. This is also a great way to investigate the '320's control capabilities. Download and install the software and you can play around with all the buttons and knobs yourself (you just won't get any receive). An "uninstall" routine is included in the program, making it easy to remove later.

If you are interested in developing your own software, you can download a "Programmers Reference Guide." A sample control program, written in *BASIC*, is included. A schematic diagram and parts list is posted as well.

Listening In

We used the receiver with several different computers. Tests were run using both the included whip and various external antennas. When using the short whip, the level of unwanted noise introduced by the computers themselves varied widely. External antennas, attached through coax feedlines, consistently provided very good reception with no perceivable computer noise. While satisfactory reception with noise-free computers using the whip is certainly possible, the enhanced performance provided by the

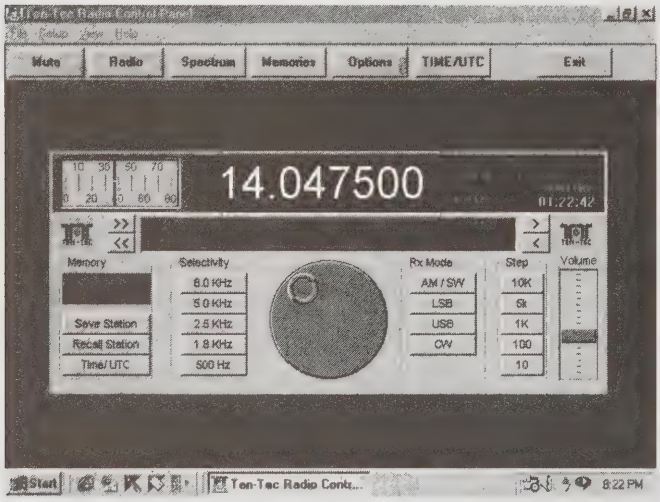


Figure 1—The virtual front panel of the RX-320. The signal strength meter can be shown or hidden using a setting on the **OPTIONS** menu.

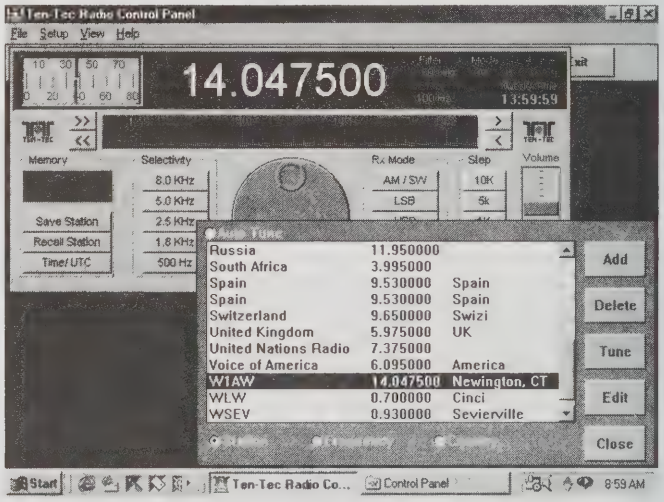
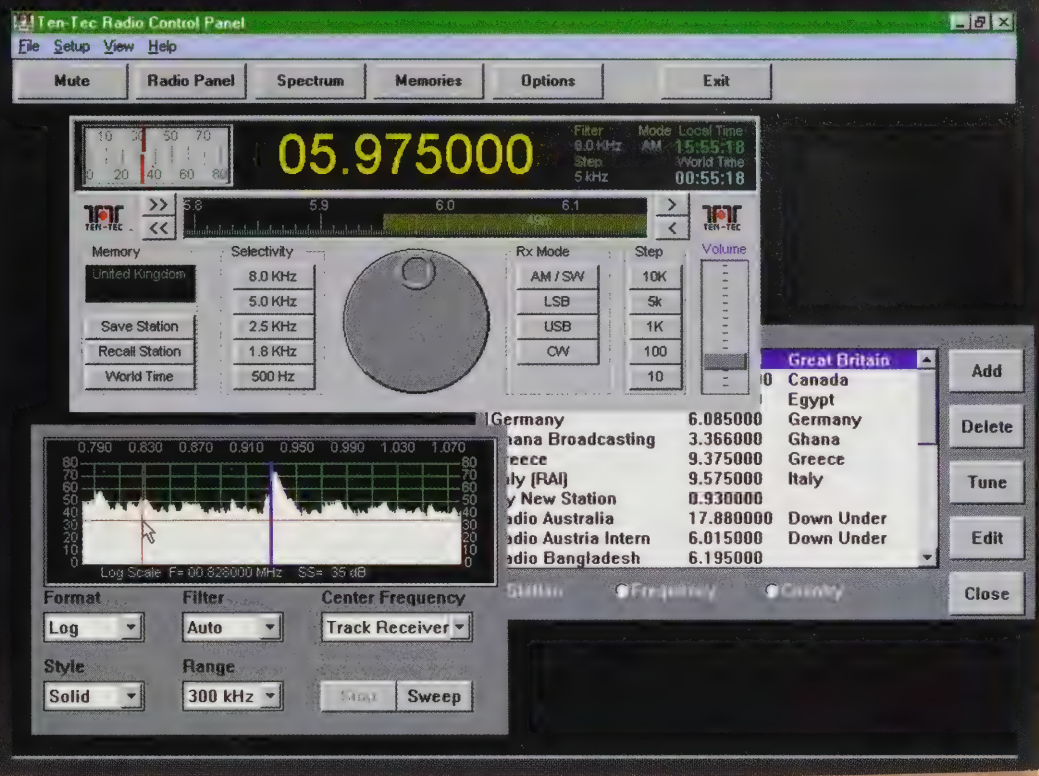


Figure 2—Click on the **MEMORIES** or **RECALL STATION** button on the main window and you'll bring up a list of your currently programmed memory information. Double-click on a station and the receiver will instantly tune to it.

PC RADIO

Model RX-320

TEN-TEC



LISTEN TO THE WORLD ON YOUR PC

Shortwave listening is no longer the exclusive domain of dedicated enthusiasts. A wealth of fascinating and enjoyable worldwide listening is a mouse click away on your PC. Starting with local AM broadcasts (same as the AM dial in your car), this band is more active than it has been in decades offering in-depth news, sports, and talk radio. After dark, this same band takes you half way across the country! But this is only the beginning.

Most countries broadcast programs around the globe on nearly a dozen international shortwave broadcast bands. In English, and nearly every other language, you hear both world and local news from their viewpoint. Programs also include cultural and political topics and even music you may never have heard before. These bands also provide a wealth of information during times of international crisis. Ham radio operators are spread out across nine bands, sometimes talking across town to friends, and often to other hams thousands of miles away. To round out the listening choices, you will hear military operations, commercial airlines, and even CB radio.

This product was designed for two types of people - the PC user who has never listened to shortwave and the experienced listener who appreciates the powerful marriage of PC and the shortwave hobby. The manual includes a phenomenal beginner's guide written by respeced author and columnist, Joe Carr.

As with most Windows® programs, you can launch the PC Radio, tune in an interesting station, and then put it in the background while you do other PC tasks. In fact, you could surf the Web and listen to shortwave at the same time!

The PC Radio is a standalone, black box that only requires access to a serial port and one megabyte of free hard drive space for the software. It runs on either Windows® 3.1 or Windows® 95/98. No need to go inside your PC or tie up an accessory slot. PC Radio includes a built-in telescoping whip antenna or listening range can be significantly extended with a simple external wire antenna.

Like conventional shortwave receivers, the PC Radio tunes from 100 kHz to 30 MHz. But the similarity stops there. This is a true Digital Signal Processing, or "DSP", based receiver. This cutting edge, software-based technology dramatically reduces the number of individual electronic components inside. This makes it possible to provide features only dreamed of in previous receivers in this price class. Even the most experienced shortwave enthusiasts will marvel at the basic performance.

- Tunes 100 kHz to 30 MHz
- Needs only a serial port and one meg of hard drive space
- Runs on either Windows® 3.1 or 95/98
- No need to go inside your PC
- Built-in, telescoping whip antenna

SPECIFICATIONS

MODES: AM, LSB, USB, CW

FREQUENCY RANGE: 100 kHz - 30 MHz

FREQUENCY ACCURACY: ±100 Hz at 25° C

MEMORIES: Limited only by available RAM in PC. Virtually any PC will store thousands of stations.

SENSITIVITY:

Mode	B/W	
AM (80% mod @ 1 kHz)	6 kHz	.64 µV for 12 dB S+N/N
CW/SSB	2.5 kHz	.3 µV for 10dB S+N/N

SELECTIVITY: 34 filters built in. Select any 5 for your personal front panel at a click of the mouse. 25 choices from 1050 to 8000 Hz bandwidth and 9 more from 300 to 900 Hz. All 1.5:1 shape factor or better.

THIRD ORDER INTERCEPT: +10 dBm

DYNAMIC RANGE: 90 dB @ 2.4 kHz bandwidth at 50 kHz spacing.

I-F REJECTION: >60 dB

IMAGE REJECTION: >60 dB

ANTENNA: 50 ohm unbalanced for external antenna. High impedance at telescoping whip connection, automatically switched out of line when external antenna connected.

PC INTERFACE: Industry standard serial interface on DB9 connector.

CONNECTIONS: +DC input, DB9 for serial port, external antenna, line output to sound card, external speaker.

POWER REQUIRED: <500 mA at 13.5 - 15 VDC, wall transformer supplied.

AUDIO: 1 watt at 4 ohms. >1 v p-p output into 600 ohms (typical to drive a sound card).

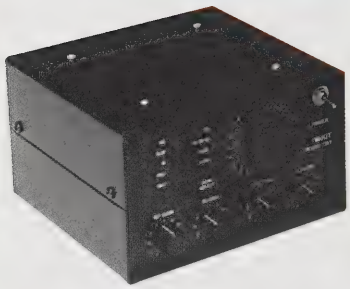
CONSTRUCTION: 2 epoxy glass PC boards, aluminum chassis, steel top and bottom.

SIZE: HWD 3" x 6.25" x 6.5" (7.6 x 15.9 x 16.5 cm).

WEIGHT: 2.5 lbs. (1.14 kg).

All specifications are typical, degraded performance below 1 MHz, subject to change without notice.

For those who like to build electronic kits, we offer two other shortwave receivers in kit form. Request our T-KIT catalog covering these and many more budget-priced, build-it-yourself projects.



9-BAND SWL RECEIVER

"First radio kit" classic. Five transistor, 3 IC design. Tune both AM broadcast and SSB/CW from 1.8 - 22 MHz. Has Main and Fine tuning, Regen, RF gain, Volume. Use built-in speaker, your own, or stereo phones. Use 8 C cells or ext. 12 VDC.

Build in 8 hrs

1253.....$59*

PORTABLE SWL RECEIVER

Enjoy quality shortwave listening comparable to factory built portables. Listen to AM broadcast as well as SSB/CW.

- 100 kHz - 30 MHz
- 15 memories
- 2.5 kHz and 100 kHz tuning steps
- Dual conversion, superheterodyne
- 13.8 VDC operation; AC wall transformer included

Build in 25 hrs

1254.....$195*

*Plus shipping & handling

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Office: (865) 453-7172
Fax: (865) 428-4483
Repair Dept.: (865) 428-0364
e-mail: sales@tentec.com
web site: http://www.tentec.com

MADE IN USA

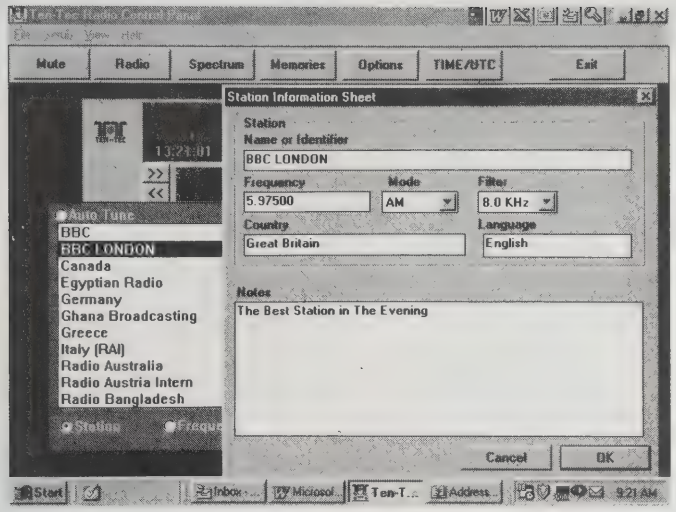


Figure 3—Memories are added or edited using this "Station Information Sheet" window. The "Notes" field is very handy for keeping program and schedule information.

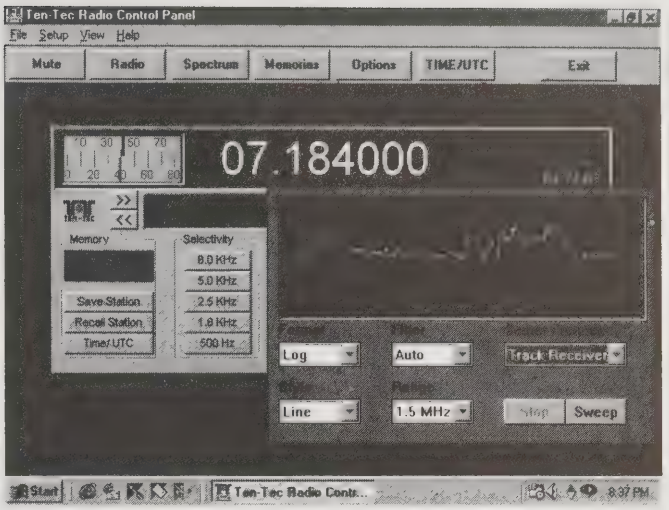


Figure 4—The RX-320's spectrum display. Activate the sweep and the unit will create a graph of relative signal strength versus frequency. Simply click on a peak to tune there.

installation of an external antenna is certainly worth the effort.

The performance of the RX-320 is very good for a receiver in this price class. I did most of my listening while connected to a 40-meter dipole. Tuning through crowded CW portions of the ham bands with the 500 Hz filter engaged revealed reasonably good selectivity, but not quite up to par with most of the currently available ham transceivers. SSB reception was also very good. The 1.8 kHz filter worked well for carving out signals on 20 meters on a busy Sunday afternoon. AM shortwave sounded great when using an external speaker, audio quality when using sound card connections varied a bit between individual computers, but generally sounded very nice.

ARRL lab test data (see Table 2) shows two-tone third-order IMD dynamic range and blocking dynamic range measurements consistent with other mid-priced shortwave receivers we've tested, and considerably better than the HF performance of the ICOM IC-PCR1000 PC receiver we featured in *QST* Product Review, July 1998. Our review unit missed spec on first IF rejection. A second RX-320 we looked at did achieve the published specification.

The strong signal handling capabilities are good, but it would be nice if the unit included an RF gain control or an attenuator, especially for those of us using external antennas.

This radio is plenty sensitive for both shortwave and ham band listening. As stated in Ten-Tec's specifications, performance drops off as you tune below 1 MHz. This is due to a high-pass filter designed to reduce interference that could be caused by strong nearby AM Broadcast stations. While the RX-320 is certainly usable for listening to AM broadcast stations, those interested in DXing the LF navigation beacons or European AM broadcast band may be a bit disappointed.

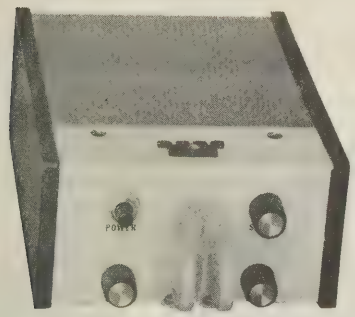
Overall, I was very pleased with the performance and ease of use of this receiver. Hams currently active on HF will appreciate it for its convenience—you can check propagation or keep an ear on a DX or net frequency while performing other computer-related tasks.

If you don't yet own a receiver for the HF frequencies, and are curious about the activity there, or if you are considering trying shortwave listening as a means of sparking radio interest in a computer consumed individual, the RX-320 certainly deserves a closer look.

Manufacturer: Ten-Tec, 1185 Dolly Parton Parkway, Sevierville, TN 37862; tel 800-833-7373; fax 423-428-4483; **http://www.tentec.com**. Manufacturer's retail price: $295.

TEN-TEC SQUEEZE KEYERS

MODEL KR20 Net price $59.95



The KR-20 is a popularly priced keyer designed for experienced amateurs. It provides crisp easy-to-copy CW at all speeds without operator fatigue.

"Feel" The most important feature is "feel". The paddle assembly incorporates a linear magnetic paddle return. Return force is adjusted by two front panel knobs which move magnetic shorting bars. With this system, each paddle can be set individually to optimum tension. Most operators like the definite break when the paddle is touched. This slight click gives a positive action even when the actuation is in the order of a few grams. The crisp action eliminates the muddy or sloppy feel of conventional paddles. Paddles can be canted for most comfortable position. Contact spacing is adjusted through holes in the top of the case.

Keyed Time Base Each character starts immediately when the paddle is actuated. A momentary closure of either paddle is all that is necessary to form a complete character **(dit or dah).**

Weight Ratio The traditional keyer has a **dit-to-dah** ratio of 1:3. A space has the same length as a **dit.** This **dit-dah**-space ratio is fairly smooth at higher speeds, but becomes choppy at speeds below 25 wpm. Accordingly, we have incorporated a character-to-space ratio extender to suit individual preference. The monitor, however, has the conventional 1:3 ratio.

Monitor A built-in monitor provides a side tone for feeding headphones or speaker. Volume and frequency of 600-1500 Hz is adjustable to suit the operator's taste. This also can be used for off-the-air code practice. For high impedance receiver input use a 220,000 ohm resistor in series with the monitor lead.

Output The output is handled by a reed relay. Rated at 15 volt-amps, it will key all regularly used keying circuits. The maximum keying voltage is 400 volts.

Speed A single control, tapered to provide linear adjustment, varies the speed from 6-60 words per minute.

Electrical The KR-20 circuitry is completely solid state. It employs one dual JK integrated circuit, nine silicon transistors and eight silicon diodes. Power source is 105-125 volts at .125 amperes, 50-60 Hz.

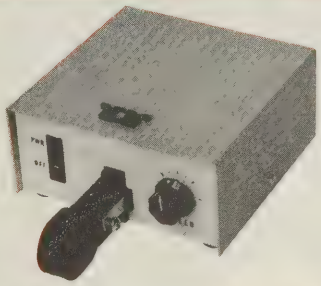
Mechanical The chassis is rigid steel. Cycolac® molded side panels have recessed wood grain finish. Nylon paddles are shaped for comfortable operation over long periods. Size: 2½" high, 4¾" wide, 8" deep. Weight: 2½ pounds. Push-on push-off switch with pilot light. Line cord: 5'.

KR6

Similar in appearance to KR-40. Embodies a new principle in paddle design. Excellent "feel". Factory adjusted weighting for smooth rhythmic CW even at low speeds. Fixed light force paddle return. Single control speed adjustment 6-60 wpm. Employs 1 dual JK IC 6 silicon transistors and 7 silicon diodes. On-Off switch. Pilot light. No side-tone oscillator provided but AC-2 can be used. Output relay handles 15 volt-amp. Size: 2½ H, 4¾ W., 8" D. Weight: 2 lbs., 3 oz.

MODEL KR6 Net price $44.95

KR5



MODEL KR5 Net Price $34.95

The KR-5 embodies a new principle in paddle construction. It provides, at low cost, action that is usually associated with higher-priced instruments. Power must be supplied by a 6 or 12 volt battery, or an a.c. operated 6 or 12 volt d.c. supply. It is excellent for mobile or fixed operation.

"Feel" The KR-5 feels good. Unlike most low-priced keyers, it seems to want to send effortlessly. Tension is pre-adjusted for optimum actuation force and return time. The molded paddles fit the thumb and forefingers of all hand sizes.

Time Base Characters start immediately when the paddle is actuated. A momentary closure of the paddle is all that is needed to form a complete character **(dit or dah).**

Weight Ratio To enhance the quality of transmission and to give it smoothness and rhythm at low speeds (below 25 wpm) a weighting factor is built-in. This is controlled by one resistor and may be changed by the owner if a different factor is desired, such as continued high-speed operation above 35 wpm.

Monitor No monitor is provided. However, the AC-2 can be connected to an output jack located on the rear panel.

Output The output is handled by a reed relay. Rated at 15 volt-amps, it will key all regularly used keying circuits. The maximum keying voltage is 400 volts.

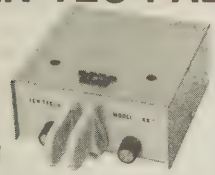
Speed Control A single control, tapered to give easy adjustment, varies the speed from 6-60 wpm. Contact spacing is made on the front panel. Anti-vibration locks are provided.

Electrical The KR-5 circuitry is completely solid-state. It employs one dual JK integrated circuit, six silicon transistors and seven silicon diodes. Power required (not furnished) is 6 volts d.c. at 150 m.a. or 12 volts d.c. at 200 m.a. An a.c. operated 6 or 12 volt d.c. source can be used.

Mechanical The case is formed aluminum, finished in durable baked enamel. Plastic parts are molded high-impact Cycolac®. Size: 2" high, 4" wide, 6" deep. Weight: 1 pound, 6 ounces.

TEN-TEC PADDLE ASSEMBLIES

KR1



The Model KR-1 Keyer paddle assembly is used in the Ten-Tec KR-20 complete keyer. The actuation paddles are mounted on torque bars which multiply the forces acting on the make-break contacts.

To return the paddle after a contact has been made (dit or dah) an ingenious magnetic structure provides the return force. Adjustment knobs on the front panel vary the position of shorting bars which attenuates the return force on the individual paddles. Each paddle can be set to suit individual taste.

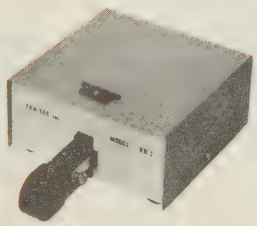
Contact spacing is adjustable through access holes in the top of the case.

In operating, there is a slight "click" which most experienced CW operators like. It seems to eliminate the "softness" and lack of control often associated with key paddles. Yet, actuation can be made with just a few grams of force.

The KR-1 can be used with either squeeze or conventional keying circuits. The entire assembly is housed in an attractive aluminum case. Size: 2 × 4¼ × 6. Weight: 1 pound.

MODEL KR1 Net Price $18.95

KR2



The Model KR-2 Keyer paddle assembly is used in the Ten-Tec KR-5 complete keyer. It embodies a unique principle in construction, allowing desirable low actuation force, simply and at low cost. It is a single paddle, not designed for squeeze keyers.

Paddle return tension is factory adjusted for optimum feel. Contacts are easily accessible from the front. Adjusting screws are spring loaded to prevent movement from vibration.

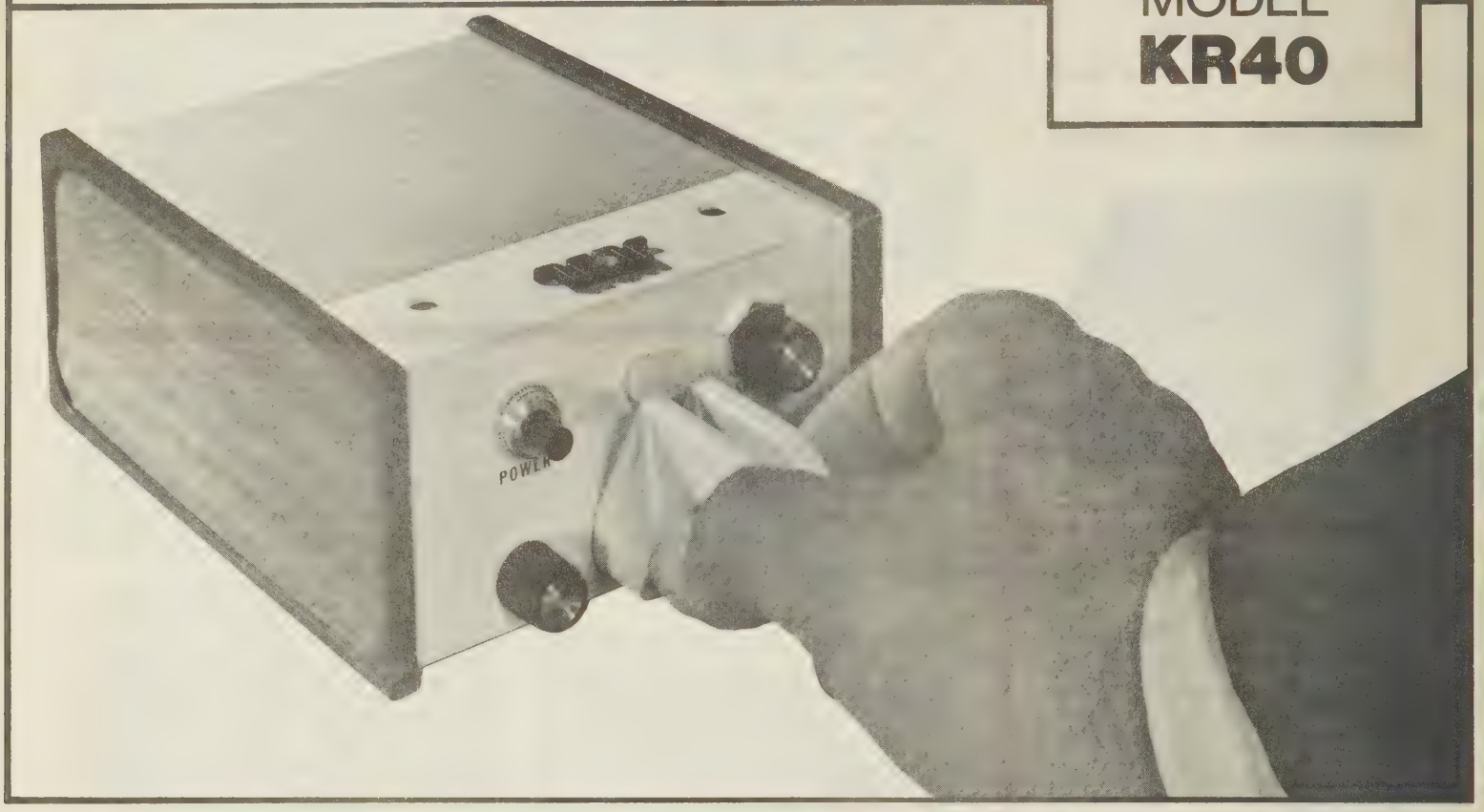
The entire assembly is housed in an attractive aluminum case. Size: 2 × 4¼ × 6. Weight: 1½ pounds.

MODEL KR2 Net Price $12.95

TEN-TEC, INC.
SEVIERVILLE, TENNESSEE 37862

TEN-TEC
SQUEEZE KEYERS

MODEL
KR40



SPECIFICATIONS

"Feel" Paddle assembly incorporates a magnetic paddle return, adjusted by two front panel knobs. Most operators like the definite break when the paddle is touched. This slight click gives a positive action even when the actuation is in the order of a few grams. Contact spacing is adjusted through holes in the top of the case.

Memories Used for both **dit** and **dah**. Correctly inserts opposite character in correct place and spacing.

Keyed Time Base Each character starts immediately when the paddle is actuated. A momentary closure of either paddle is all that is necessary to form a complete character.

Weight Ratio The traditional keyer has a **dit-to-dah** ratio of 1:3, space the same length as a **dit**. This ratio is fairly smooth at higher speeds, but becomes choppy at speeds below 25 wpm. Accordingly, we have incorporated a character-to-space ratio extender to suit individual preference.

Monitor A built-in monitor provides a side tone for headphones or speaker. Volume and frequency of 600-1500 Hz is adjustable. This also can be used for off-the-air code practice. For high impedance receiver input use a 220,000 ohm resistor in series with the monitor lead.

Output The output is handled by a reed relay. Rated at 15 volt-amps, it will key all regularly used keying circuits. The maximum keying voltage is 400 volts.

Speed A single control, tapered to provide linear adjustment, varies the speed from 6-60 words per minute.

Electrical The KR-40 circuitry is completely solid state. It employs four integrated circuits, 11 silicon transistors and 3 silicon diodes. Power source is 105-125 volts at .125 amperes, 50-60 Hz.

Mechanical The chassis is rigid steel. Cycolac® molded side panels have recessed wood-grain finish. Nylon paddles are shaped for comfortable operation over long periods. Size: 2½" high, 4¾" wide, 8" deep. Weight: 2½ pounds. Push-on/push-off switch with pilot light. Line cord: 5'.

EASY TO LEARN, EASIER TO USE

A TEN-TEC top-of-the-line Squeeze-keyer designed for the serious CW amateur operator. A keying technique of **dit-dah** insertion that reduces effort, produces smoother, easier-to-send-and-copy CW. Learning time is usually just a few hours for those using conventional keyers, often less for those who have not had electronic keying experience.

Operation is really quite simple. For example, to make a letter C (— · — ·), merely squeeze the two paddles for the proper time duration. A letter Q (— — · —) is made by holding the **dah** paddle and at the right instant inserting the **dit** between the second and third **dah.** An R (· — ·) is formed by a short squeeze with the **dit** paddle engaging first. For a K (— · —), press the **dah** paddle first. Other characters composed of intermixed **dits** and **dahs** are formed in the same fashion.

This technique adds a new flavor to high CW skill and enhances the fascination of code communication. It performs equally well over the entire speed range.

KR40 . . . . Net price **$89.95**

...America's Best!

TEN-TEC

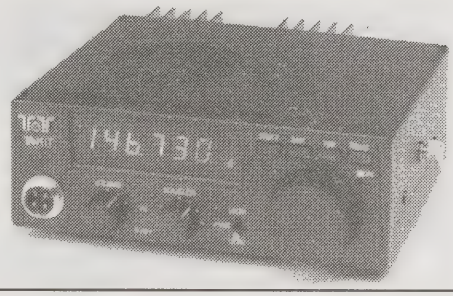
T-KIT

RADIO KITS & ACCESSORIES CATALOG

T-Kit MODEL 1220 transceiver

The Model 1220 FM/Data Transceiver shows just how serious T-KIT is about filling the big void in ham radio kit building. Why pay hundreds more? You do NOT have to rely on imports for a 2-meter FM transceiver with the modern features which today's hams take for granted. And you won't have to settle for a stripped down performance of other VHF kit transceivers. You'll learn from building it how to take care of it yourself.

T-KIT



Model 1220 Typical Specifications: Sensitivity .2 uV for 12 dB SINAD. Deviation +/- 5 kHz. Dynamic Range: 70 dB (2 tone, 3rd order IMD @ 20 kHz from 146 MHz (. Adjacent channel rejection: 70 dB (@ 20 kHz from 146 MHz).

T-KIT Model 1220 Transceiver Features:

- Advanced microprocessor-controlled design
- Front-panel knob tuning of 143.500-148.500 MHz in 5kHz (or 2.5 kHz) steps
- 15 Memories store frequencies with repeater offsets and sub-audible tones!
- Store up to five non-standard TX offsets (CAP, MARS, etc.)
- Bright 6-digit LED display resolved to 5kHz channel tuning steps
- LED indicators for TX Offsets, Simplex, RX Busy, TX On-Air, CTCSS tone ON
- Built-in speaker plus external speaker jack
- Optimized, standardized packet circuitry, standard DIN connector
- Hand Microphone and Mobile Mount…..Both included!

Build it now for 5 Watts or 30 Watts, or upgrade to 30 Watts later

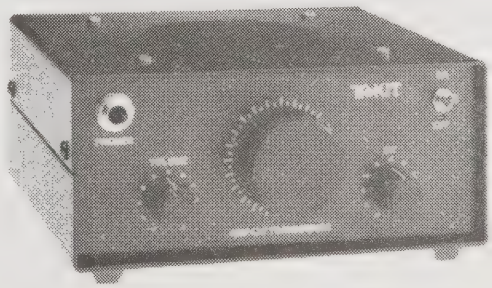
- Contemporary molded front panel and steel case are standard, not extra!
- Instantaneous, silent PIN diode T-R switching
- Full CTCSS sub-audible TX tone set BUILT-IN, microprocessor-controlled

T-KIT Model 1220 Transceiver Kit, 5 Watts Output

Model 1222 30 Watt amplifier module kit for Model 1220

Take your favorite CW band anywhere !

Ten-Tec began in 1968 with the release of very inexpensive "QRP" transceivers. We thought it would be fun to revisit those roots. We explored today's RF technology and components to see just how inexpensive, compact and simple a quality QRP kit rig could be. The low price and great receiver design make those QSK VFO-controlled transceivers a smart choice for those times and moods when you want to try a few watts of RF output. Get on the air from the beach, or a mountaintop, or your office or dorm room!



Frequency Coverage: VFO tuning of any 50 kHz segment of CW sub-band. Tuning range is selected during winding of one toroid in the VFO circuit.
Frequency Control: Varactor tuned oscillator with potentiometer control. Temperature compensated LC components stabilize VFO.
RIT: (Receive Incremental Tuning) +/- 1.5 kHz.
Antenna: 50 ohm unbalanced, SO-239 connector.
Power requirement: 12-14 VDC, 35 mA receive (no signal),80 mA receive (S-9 signal), 800 mA on transmit.
Construction: Black texture painted clamshell-type steel top and bottom, Aluminum chassis, sub-panel and heatsink. One 3.5"x5" double-sided circuit board.
Board-mounted Components: 216 including 4 IC's, 19 transistors, 13 diodes.
Front Panel Controls: main tuning, RIT, volume, DC on-off toggle.
Connectors: front panel 1/4" stereo phone jack; rear panel SO-239 for antenna, 3 RCA jacks for key, DC input, accessory DC output.
Dimensions: HWD 2.75"x6"x6". Weight 2.25 lbs/1.02 kg.

TRANSMIITER:
RF Output: 3 watts typical, no external adjustment.
T/R Switching: solid state, full break-in.
CW Offset and Sidetone: Adjustable 400-1000 Hz sidetone automatically tracks offset frequency.
Sinewave sidetone has internal adjustment.

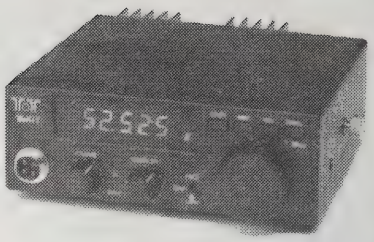
RECEIVER:
Type: single conversion superhet, JFET mixer.
Sensitivity: .25 uV typical for 10 dB S/N.
Selectivity: 4-pole crystal ladder filter (1 kHz nominal bandwidth)
AGC: audio derived
IF Frequency: 11 MHz on 80 and 40 meter models; 14.32 MHz on 30 meter model; 6.14 MHz on 20 meter model.. 16 MHz on 15 meter model.
Audio: 300mW @ 4 ohms. Built-in 3" speaker.

T-KIT Model 1315 for 15 Meters
T-KIT Model 1320 for 20 Meters
T-KIT Model 1340 for 40 Meters

T-KIT Model 1330 for 30 Meters
T-KIT Model 1380 for 80 Meters

T-Kit MODEL 1260 transceiver

•15 programmable memories
•Ready for 6M's varying transmit offset schemes
•Microprocessor-controlled
•Complete with microphone, internal speaker and mobile bracket

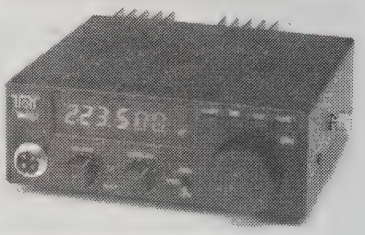


Read about the 1220 2M transceiver and imagine the same great-looking rig ready for easy and fun 6M FM repeater or simplex action, no matter what kind of transmit offset scheme is employed! FCC regulations currently prohibit the sale of an add-on amplifier, but our happy transverter owners can tell you that a few watts on 6M is a blast!

T-KIT MODEL 1260 5-Watt 6-Meter Transceiver KIT

T-KIT MODEL 1230 Transceiver

2-Meters Getting Crowded? Discover 220 MHz Action!



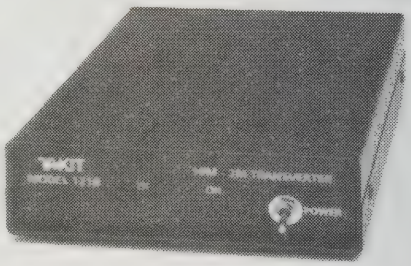
Engineered specifically for the 222-225 MHz band, using integrated 220 MHz RF power module for simplified construction and alignment. Front-panel switching of 4-5 watts or 20 watts of RF output. Shop around: the Model 1220 is the lowest-priced 220 MHz rig on the market with the features you need and expect. Microprocessor-controlled, 15 memories, tunes 221.800 – 225.200 MHz in 10 kHz steps, plus Memory Scan. General operating features similar to Models 1220 and 1260.

T-KIT MODEL 1230-20 Watt FM Transceiver KIT
Includes microphone and mobile mounting bracket.

T-KIT MODEL 1210 Transceiver

Operate 2 Meters
In Any Mode with Your 10 Meter Transceiver!

For only $139, add 2 meters to any HF transceiver. Ideal new use for all those idle 10 meter mobile rigs. Full 10 watts RF output. ALC-controlled 10M input handles power range of 4 to 20 watts. Solid-state T-R switching. Engineered from scratch for optimized 10M-2M conversion performance. Compact: 1.5"H x 5"W x 8"D.



Model 1210 Specifications:
Frequency Coverage: 144-148 MHz band, typically 144-145.7 MHz, based on 28-29.7
MHz tuning range of most 10-meter transceivers. 116 MHz local oscillator.
Power requirements: 12-14 VDC, 100 mA receive, 600 mA in transmit with no drive, 2.0A on transmit at 10 watts output.
Construction: Black texture painted clamshell-type steel top and bottom, aluminum panel/chassis and heatsink. One 5.5"x3.75" double-sided circuit board.
Semiconductors: 2 IC's, 13 transistors, 25 diodes, RF final: BLW81.

TRANSMIT:
RF output: 10 watts maximum on CW and FM, 10 watts PEP on SSB.
T/R switching: solid state, RF sensing.
Output Power Adjustment range: 2 to 10 watts.
Spurs and Harmonics: Greater than –56 dBc at 10 watts.
Standard TX Hang Time: Approximately 1 second.
Input Drive: Less that 0.5 watts input to key TX mode. 4 Watts input for 10 watts output. Input drive is ALC controlled between 4 and 20 watts. Input SWR less than 1.5:1.

RECEIVE:
Conversion Gain: Approximately 17 dB.
Image Rejection: Greater than 60 dB.
Input Intercept: -6.5 dBm typical.

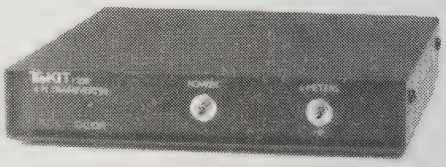
T-KIT Model 1210 10M-2M
Transverter KIT
Model 1210A Factory Assembled,

T-Kit MODEL 1208 transverter

SSB-CW-FM 6-Meter Transverter

Let's Get Together and REPOSSESS 6 Meters!
The T-KIT 1208 Transverter lets new technicians and old-timers alike repossess 6-Meters at a VERY nice price!

Add the excitement of the 50 MHz amateur band so easily to ANY modern ham transceiver, including all those 20-Meter only QRP rigs. A Transverter lets you transmit as well as receive on 6-Meters, using the precision digital tuning, available modes, memories and other features of your HF transceiver. It's simple: 14.000 MHz on your display or dial is 50.000 MHz. To operate SSB on 50.200 MHz, simply switch the 1208 to 6-Meters, tune to 14.200, keep transceiver RF output under 5 watts, and just got for it! The 8 watts RF output is generous power during good band openings and for local communications and repeaters.



Features:
- **Use with any transceiver capable of 3-5 watts on 20-meters.**
- **Extremely simple hookup and operation.**
- **Low-noise 50-54 MHz receiving input.**
- **Easy front-panel switching between HF and 6M operation.**
- **Fast, silent RF-Sensing PIN diode T-R switching for QSK and data communications.**

Specifications and Operating Requirements: 12-15 VDC at 3.0 amperes external DC power requirement. RF output at 51 MHz: 8 watts typical. • Standard 20M transceiver required for basic 50.000-50.350 MHz Beacon/CW/SSB operation. •FM operation requires FM transmit/receive capability of a general coverage transceiver capable of 14-16 MHz operation, with repeater offsets being a function of the transceiver's VFO memory system.• Receive 50-54 MHz; transmit 50-52 MHz (transmitting above 52 MHz is not recommended). •The 14 MHz transceiver output MUST be attenuated to 5 watts or less.

T-KIT MODEL 1208 Six-Meter Transceiver Kit.

We Accept: VISA • Mastercard • Discover

T-Kit MODEL 1209 transverter

8 Watts RF output on 6 meters from your 2 meter rig or HT

More Ways to Explore 6 Meters!

Newly-licensed hams: explore your operating privileges beyond 2 Meters very economically! Operate 5-54 MHz on any mode covered by your 144-148 MHz rig or HT. With the same general features and specifications as our popular 1208 6-Meter Transverter, the Model 1209 was designed for those regions where 6M FM repeaters take the load off the busy 2M systems. And you may find yourself making cross-country simplex QSO's during those exciting 6M band openings.

Just Think: Only $304 gives you BOTH 2 meters and 6 meters.....If you build and use the 1220 Transceiver and 1209 Transverter!

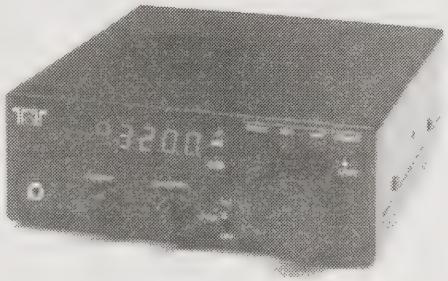
T-KIT MODEL 1209, Six-Meter Transverter Kit

No. 1209A, factory assembled
No. 1208, 20 to 6 version NOT available factory assembled.

T-Kit MODEL 1254 Receiver

Enjoy TEN-TEC receiver quality with digital tuning for worldwide AM-SSB-CW, from 100kHz to 30 MHz!

T-KIT Shortwave Receiver Model 1254: only $195 and the smoothest kit-building experience you can imagine. The grand tradition of receiver kit building is no longer confined to direct-conversion or regenerative designs! The model 1254 combines the satisfaction of a serious kit building experience with the performance features expected in a modern HF receiver at a very competitive price. You will build a true dual-conversion superhet with a microprocessor-controlled frequency synthesizer. Building this receiver yourself gives you the assurance that you can maintain it in perfect working order.



BUILDING SKILL LEVEL: Intermediate BUILDING TIME: 20 to 25 hours

Frequency coverage: 100 kHz to 30 MHz Modes: AM, SSB/CW
Main Tuning: Normal or Fast tuning (2.5 kHz SSB, 5.0 kHz AM, or 100 kHz steps for either mode)
"Clarifier" Control: for +/- 1.5 kHz SSB/CW fine tuning between 2.5 kHz steps
Front panel controls: On/Off switch, Tuning, Volume, Clarifier, Mode Select, Memory Write (MW), VFO/Memory tuning select (V/M), Tuning Rate Select (SPEED)
Memories: 15 programmable memories
Circuit: Synthesized 45-75 MHz local oscillator, 45 MHz first I-F, 455 kHz second I-F
Sensitivity: AM mode: 2.5 uV for 10 dB SNR at 30% modulation SSB/CW mode: 0.5 uV for 10dB SNR
Selectivity: 4kHz @ -6 dB
Frequency/Memory Display: 6-digit green LED with mode indicators
Power Supply: 12-15 VDC, 250 mA current consumption with no signal present. 15 VDC @800 mA wall transformer supply included with kit.
Antenna Connector: 50 ohm input, RCA style phono jack
Audio: 1.5 watts audio output to internal speaker, plus 1/8 inch stereo phone jack for standard personal headphones or direct feed to 4-8 ohms external speaker, data interface or both.
Semiconductors: 10 IC's, 26 transistors, 16 diodes
Compact Size: 2.25" x 6.5" x 6.5" (HWD)
Construction: Steel clamshell case, aluminum chassis, and custom-molded front panel.

EASY ALIGNMENT!
Yesteryear's serious superhet receiver involved many dozens of alignment points, usually requiring professional service equipment, often scaring away the casual hobbyist. To "align" your state-of-the-art Model 1254, you need only a VOM and your ear! During kit construction, we provide Progress Tests for each of the 6 assembly phases. The receiver generates its own built –in 45 MHz test signal.

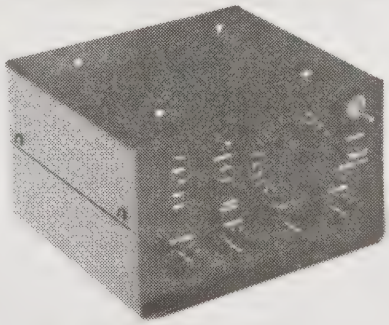
T-KIT MODEL 1254

T-Kit MODEL 1253 Receiver

The classic "first radio kit" is back and better than ever!

We've combined the very same audio circuit of TEN-TEC transceivers with a modern FET design for classic regenerative SWL receiving plus one-button electronic band switching. The result is an easy-to-build shortwave radio that's fun and interesting for the whole family. No alignment required. Simply install all parts as directed, put together the high-quality mechanical parts, and start enjoying the magic of shortwave radio. Explore 9 smooth tuning SWL and ham bands from 1.8 to 22 MHz at the push of a button! Receives AM, SSB, CW and all those other magical shortwave sounds.

Features: Front-panel RF gain, Volume, Regeneration, Tuning and Fine-Tuning controls. Generous audio from Signetics TDA 2611A to built-in speaker or stereo phone jack. Electronic switching of 9 tuning ranges. Rugged, rounded clamshell steel enclosure. Simple, clear linear logging scale for large tuning knob. Requires 8 alkaline C cells or external 12VDC.

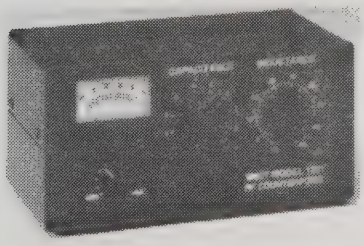


9-Band Shortwave Receiver

T-KIT MODEL 1253

On a tight budget with a club of eager radio builders? Our 4-Band **Model 1054** Module Board Kit has comparable features for only **$24!**

Compact RF ground Counterpoise



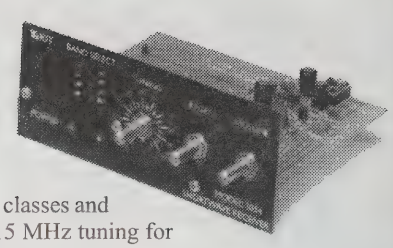
At a fraction of the cost and size of other "artificial ground" gadgets, the T-KIT 1251 helps solve those annoying RFI/TVI and "hot chassis" problems caused by a lack of proper RF ground. Ideal for condo and travel situations where PVC plumbing makes classic water pipe grounding schemes impossible or if a good ground is too far away from the station. While NOT a substitute for a vertical's radial system or for the basic safety grounding required for all installations, it does provide a "tuned counterpoise" to satisfy the transmitter's need for a correct RF ground path.

T-KIT MODEL 1251

T-Kit MODEL 1054 Receiver

(Kit INCLUDES drilled, painted, silk-screened aluminum front panel!)

A New World of *Budget-Priced* Receiver Projects!



Here it is: Proof that the classic "first receiver" project need not be more expensive today than your favorite 1950's kits.

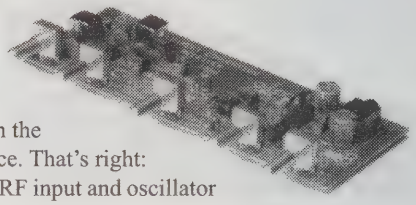
In fact, this great little receiver beats the pants off those 3-tube radios with the big plug-in coils. Excellent for clubs, classes and family activities. Band coverage: 49 Meter SWL band, 40 Meter ham band, 31 Meter SWL band, plus exciting 12-15 MHz tuning for daytime shortwave listening, 20 Meter ham band and all those other magical shortwave sounds. The sharp-looking front panel gives the "real radio" look right away: dress up your project later with a case and knobs, and perhaps a speaker. You can enjoy the basic kit just by hooking up 9 to 12 volts DC, setting up a modest wire antenna (10 feet or more of hookup wire) and plugging in your own stereo headphones (1/8" plug). Features convenient push-button band switching, on-off switch, "on" LED, tuning, volume, regeneration control.
User provides speaker or headphones.

T-KIT MODEL 1054
Suggested Enclosure-Plus Pak, No. 1000B

Attention Club Leaders!
No. 1054C CLASS-Pak:
Includes five 1054 Receiver Kits, Instructor's Notes, Spare-Parts Kit,

T-Kit MODEL 1056 Receiver

"ANY BAND" Direct-Conversion SSB/CW Receiver



This is your best buy, by far, for a ham band direct conversion receiver kit. It has better audio and filtering than the others, and we supply the parts and instructions to let you build or for (or change it to) ANY band of your choice. That's right: YOU choose the band! Many hams KNOW that there are only minor coil and capacitor differences in the simple RF input and oscillator sections of a basic direct-conversion receiver. We give you ALL parts needed to build for your choice of 160, 80, 75,40,30,20,17,15,12 or 10 meters! Try out you own multi-band switching ideas. Start planning a budget-priced QRP transceiver that will really WORK!

Design Features:

- •Signetics NE612 mixer-oscillator
- •True varactor tuning (MV209)
- •Zener diode regulation
- •LM358 op amp bandpass filter
- •Front-panel bandpass control
- •Signetics TDA2611A audio amplifier IC
- •Stereo jack for economical "Walkman" headphones
- •Plenty of speaker audio
- •Separate "Bandset" and s-m-o-o-t-h 20 kHz "Bandspread" tuning controls!
- •RF gain control
- •Provision for TX sidetone injection
- •Provision for receiver audio muting during transmit
- •Efficient 6 " Wx2" D board layout; take your favorite ham band ANYWHERE!
- •Jumper provision for separate DC supply to audio IC
- •Operate on 12-15 VDC

T-KIT MODEL 1056
Suggested Enclosure-Plus Pak, No. 1000C

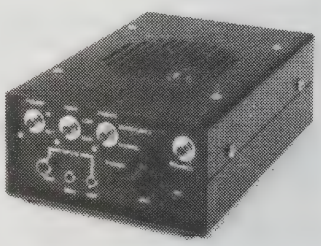
NOTE TO BEGINNERS: Contrary to some advertising claims, a direct-conversion receiver is very good for CW/SSB but cannot provide very pleasant listening for short-wave AM broadcasts (BBC, Radio Moscow, VOA, etc.).
For general listening, we suggest **T-KIT MODEL 1054 or 1253.**

TeKIT

T-KIT No. 1252

Hi-Sensitivity Audio Amplifier With Experiments

Listen to the Mysterious Sounds of ENERGY!



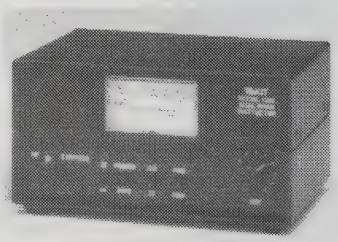
A wonderful project for experimenters of all ages!
Build a rugged, versatile, portable utility amplifier (for which you'll find dozens of practical uses over the years). Then, begin to explore the fascinating world of the unique sounds made by all kinds of energy – from lightening whistlers on the other side of the world to the stress noise of a bending paperclip. Listen to radar, to light waves, to your computer. Listen to nearby radio signals on any frequency, any mode. In addition to the kit assembly manual, you get a fascinating project booklet based on experiments by USAF Engineer Calvin R. Graf as your guide to adventures with the sounds of energy. Amplifier features hi and low Z inputs, switchable preamp, 1.5W output. Requires 8 "AA" batteries or external 12-15 VDC.

T-KIT No.1252

Note: The kit includes accessories for many of the energy listening experiments. You will need 1x2" wood (furring strips) and wire to build the 4' loop antenna explained in the project booklet.

20/200 Watt SWR Bridge & RF Wattmeter

... For BOTH 1.8-30 MHz AND 144-148 MHz!



Build this top-quality station accessory that you'll use for a long, long time. Features easy-to-read meter, front panel switching of 20 or 200 watt ranges, HF or 2-Meters, sensitivity control, four SO-239 antenna and transmitter connectors, all housed in a rugged steel enclosure less likely to bounce at the mercy of RG-8 coax! Range: 1.8 to 30 MHz plus 2 Meters! Separate HF and VHF connectors let you leave the unit in-line with BOTH rigs. Convenient toggle switching between HF and VHF. This is your USE-ANYWHERE RF power/SWR meter system!

T-KIT Model 1202 SWR Bridge Kit

We Accept: VISA • Mastercard • Discover

RF Dummy Load - 50-Ohm, 300 Watts

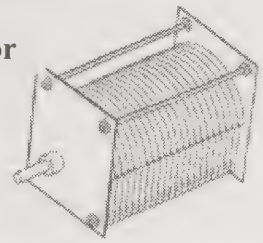
"I know I SHOULD be using a dummy load for this test. Will this giant surplus resistor work? What's the impedance of this big old light bulb?"

YES, a dummy load is the least exciting of all radio tools. But, there are those times when it's the right tool for the job. Your complex transceiver suddenly acts like a QRP rig: is it the rig, the tuner or the antenna? Loading the rig directly into the 1203 Dummy Load will report the basic health of your transmitter section. Save $$ by building this easy kit yourself. With many common-sense uses, this is the boring accessory you'll really appreciate whenever you start to wonder what's going on with ANY transmitter setup. Good for HF and VHF.

T-KIT No. 1203 Dummy Load Kit

T-KIT No. 1207 40-500 pF Rated 3.5 KV

Yes, You can build a **High-Power Variable Capacitor**



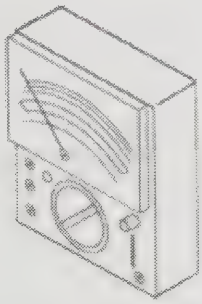
What? Me build a capacitor? Air-variable capacitors cost $$$ these days because of all the hand labor of putting them together. If you'd like to spend part of an evening reliving those grand old Erector Set days, save money by assembling your own high-power variables from our top quality factory-ware. Build the same tuning capacitors use in world-class TEN-TEC 1.5 KW RF amplifiers and tuners. Great for all high-power homebrew projects, including experimental loop antennas.

T-KIT No. 1207 also available as(TEN-TEC assembled **No. 80-858)**

Economical Multitester

We found this great value in a taut band, mirrored scale VOM with handy extra features. We were so impressed with its performance that we decided to offer it here for sale to our customers. (Not a Kit: assembled only.)

20,000 ohms/volt
DC volts: 0.1, 0.5, 2.5, 10, 50, 250, 1000
DC current: 50uA, 2.5, 25, 250 mA, 10 A
Resistance: to 20 megohms
AC volts: 10, 50, 250, 1000



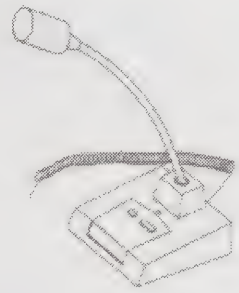
Audible continuity checker
hFE transistor testing
Built-in battery tester
Rear panel pop-out stand
4"W X 6"H X 1.5"D

TEN-TEC Model 1130 Multitester assembled

Communications Desk Microphone

If you want your station to have the same quality of desk mike expected by demanding TEN-TEC transceiver users, at a great price savings, here's your chance to build and learn all about a proven desk-style communications mike that will compliment and HF or VHF transceiver.

T-KIT 1201 Mike Features:
Choice of PTT or VOX operation.
Electronic lock and release of PTT.
Sensitive op-amp preamplifier.
LED "on" indicator.
Type: Electret Condenser.
Sensitivity: -52 dBV/1 ubar
Uses 7-14 VDC from rig or internal 9V battery.

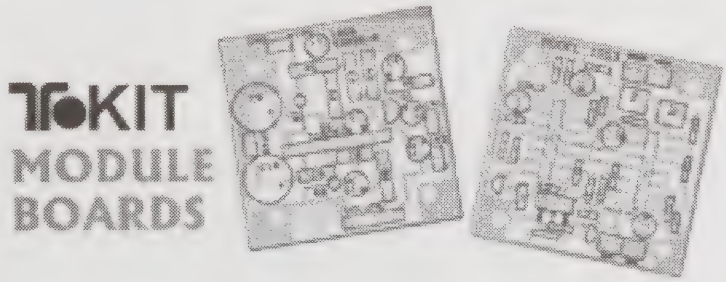


T-KIT no. 1201 Desk Microphone Kit
TEN-TEC Model 705 (factory wired/tested)

MICROPHONE CONNECTORS: Because various styles of connectors or plugs are used in ham and audio equipment, the 1201 microphone kit is shipped WITH shielded coil cable but less connector. RadioShack stocks most standard connectors. Current TEN-TEC microphones include 4-pin connector standard for all TEN-TEC and T-KIT transceivers.
TEN-TEC No. 35057, 4-pin microphone connector, $3.00

T-KIT MODULE BOARDS

These "smaller" but carefully engineered T-KIT boards are for hams and experimenters who use their own hardware and ingenuity to custom-finish a project. You get the circuit board with all needed I/O pads, all board-mounted parts, a well-engineered circuit and the same high quality step-by-step instruction manual that is the hallmark of all T-KITS. Finish the job with your own switches, connectors and enclosure, or a get a great head-start with a T-KIT Enclosure-PLUS Hardware Pak featuring TEN-TEC's easy-to-use blank aluminum boxes, plus a useful assortment of finishing hardware and components.



Utility Audio Amplifier

Need a quick, reliable, inexpensive audio amplifier stage for that homebrew project? This careful design gives your project the very same audio output circuit that we use in today's TEN-TEC transceivers! Enjoy 1.5 watts of low-distortion audio with no worry about motorboating and other unwanted oscillations. Includes optional preamp input for 10 dB gain. Important: This circuit is designed for 12-15 VDC.

T-KIT No.1550

Foxhunt "Beep-Beep" Transmitter (for FM Broadcast Band)

Here's a great gadget at a great price for clubs, classes, scout troops and packs, camps and family fun! Tune it to any quiet part of the 88-108 MHz FM band per FCC Part 15 rules, noticing its distinctive "beep-beep" modulation, and let the kids use their own FM portable radios to discover the basics of direction-finding. Hide it indoors on rainy days! Includes board-mounted on-off switch and 9V battery snap. Use several to demonstrate triangulation.

T-KIT No. 1059

We Accept: VISA • Mastercard • Discover

MORE T-KIT MODULE BOARDS.....

Universal Low-Noise Broadband DC to 1 GHz RF Preamp

You KNOW that every kit company sells some sort of broadband preamp for all purposes. If you want to try a broadband, untuned RF preamp on any receiver or scanner or other instrument, THIS one is your best buy! Excellent noise figure, gain and frequency coverage at a BUDGET PRICE! Up to 18.5 dB gain at 100 MHz. 17 dB gain typical at 500 MHz. Supply voltage: 8-14 VDC.

T-KIT No. 1001

"Smart Squelch" Band Opening Alert

Also known as the DXer's "integrating squelch," this great circuit liberates your family from hiss, whines and other noises when your receiver is tuned for those unpredicatable openings on any HF or VHF band that usually seems DEAD. This "integrating" squelch responds to the cumulative effect of several seconds of weak signal rather than to isolated noise bursts. Connect between rig and external speaker; no receiver modification required. You supply creative 12 VDC alarm devices (piezo, chime, strobe light, etc.) Also may be used to add conventional squelch to older receivers, any mode.

(Strong signals break squelch quickly.)

T-KIT No. 1064

Suggested Enclosure-Plus Pak, 1000A

Transmatch Tuning Bridge

Have you ever wondered what good one of those $60-$100 "R-X Noise Bridges" could do for YOUR station setup? Are you baffled by your antenna tuner or "transmatch"? The 1051 is easy to build and super easy to use. No "R-X" controls, calibration or calculations needed. Just connect it between your rig and antenna tuner, set the receiver to the desired operating frequency, and adjust the antenna tuner until the distinctive modulated pulses (Not Just Noise!) drop to an easily recognized "NULL" indicating that the tuner offers a 50-ohm match to your transceiver. No on-the-air nervous experimenting with the tuner controls.

T-KIT No.1051

Suggested Enclosure-Plus Pak, No. 1000A

Microphone Speech Processor

While speech processing IS a standard feature of today's SSB transceivers, there's plenty of nice equipment at hamfest flea markets, which can benefit significantly from the addition of this proven speech processor circuit used in many TEN-TEC transceivers. If there's room, build it into that older rig. Or, design it into that audio console you've been planning, or just use a neat TEN-TEC box!

T-KIT No. 1551

Suggested Enclosure-Plus Pak, No. 1000A

T-Kit MODEL 1050 Receiver

Universal BFO for SWL Receivers

Got an old (or very new) AM-only shortwave radio with no CW-SSB capability? If you want to enjoy casual CW-SSB reception, this varactor-tuned 455 kHz oscillator may be built into larger receivers or else mounted in its own case and placed near your portable SWL radio. The on-board tuning control compensates for alignment variations from one receiver to another in addition to permitting fine-tuning of SSB/CW signals. Operates on 6 to 15 VDC.

T-KIT MODEL 1050

Suggested Enclosure-Plus Pak, No. 1000A

Active Antenna for Receivers

If you've been curious about what an "active" receiving antenna can or cannot do, without paying the $40-$100 cost typical of both kit and manufactured units, you will enjoy the experience, learning about and using this very simple, budget-priced kit. Just for fun, we carefully tested this little T-KIT 1552 Module board next to active antennas sold by Heath, MFJ, and Ramsey. Wow: you'll get the performance without the price tag! Bring ANY HF receiver to life with the 1552 and a small length of wire, or a simple whip antenna! Compact 1.75" square board can be mounted inside a receiver or in its own small box. Circuit includes gain control; operate on 6 to 15 VDC.

T-KIT No. 1552

Suggested Enclosure-Plus Pak, No. 1000A

Budget Electronic Keyer

A classic circuit and a nice price make this a great project for beginners or for building into extra rigs. Includes speed control, weight control (rarely offered in "simple" CMOS circuits) and sidetone pitch control. A lot of keyer for the price, it features self-completing dits and dahs for standard single-level keyer paddles. While not designed for iambic operation, the price and reliability make the 1553 a very nice introduction to electronic CW keying.

T-KIT No. 1553.

Suggested Enclosure-Plus Pak, No 1000A

T-KIT ENCLOSURES-*Plus* hardware Packs

With three sizes to fit all T-KIT Module Boards, these nifty enclosures-PLUS Hardware paks give you real choices for dressing up your small kit projects:

- **Dig through and make good use of your own parts collection**
- **Shop[at Radio Shack, local distributor or next hamfest**
- **Enjoy the practicality of a T-KIT ENCLOSURE-PLUS Hardware Pak**

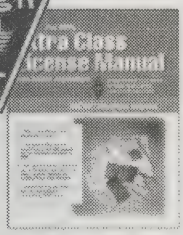
All Enclosure-Plus Hardware paks include: TEN-TEC TP-series aluminum box suitable for your project, mechanical hardware, plus helpful toggle switches, knobs, etc. You may get more than needed for one project: all the extra goodies to your parts drawers for your next T-KIT MODULE BOARD project!

Connectors: Since there are so many **different** hookup methods useable for RF, DC, audio, and other connections, we must leave it up to you (or your Radio Shack store, ham buddy or hamfest) to choose what's handiest for rear-panel hookups.

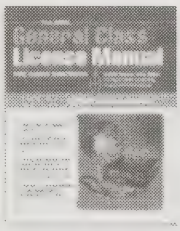
THREE Convenient T-KIT Enclosure-Plus Hardware Pak sizes:

• T-KIT No. 1000A (standard)
(TP19 box (2x4-3/4x4), DPDT toggle, wire/mini-coax pak, knob, misc. hardware.)
• T-KIT No. 1000B (medium) (tops in value and general usefulness)
(TP41 box (2-1/4x5-1/2x4-1/4), DPDT & SPDT, 3 knobs, wire/coax pak, hardware.)
• T-KIT No. 1000C (deluxe)(for 1056 receiver, similar projects.)
(TP45 box (2-3/4x6-1/2x5-1/2), SPDT,wire/coax hardware, 5 knobs, 3" speaker.)

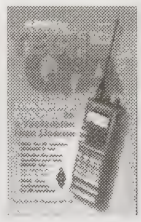
ARRL PUBLICATIONS



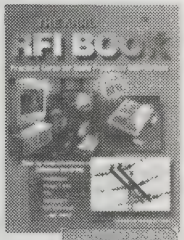
License Manual: Extra Class. ARRL study guide for the Extra Class license exam. Includes the latest question pool. Detailed explanations for all questions, including FCC rules.
ORDER # R5000



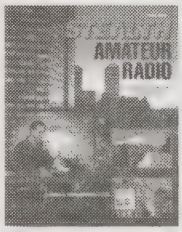
License Manual: General Class. ARRL study guide for the General Class license exam. Includes the latest question pool. Detailed explanations for all questions, including FCC rules.
ORDER # R5001



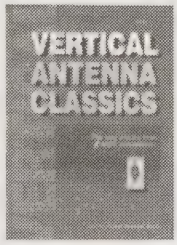
License Manual: Tech Q&A. ARRL question and answer guide for the Technician class license exam. Includes brief explanations after each question.
ORDER # R5002



Radio Frequency Interference. The authoritative source for practical interference cures. Automotive, television, computers, lamps, VCR's, TV's, power lines, electric fences and a host of other interference sources are discussed along with a wealth of practical information on problem solving.
ORDER # R5014



Stealth Amateur Radio. Set up and operate a station without calling attention to yourself. Operate successfully at QRP power levels. Install safe antennas, including indoors. Tips on portable operation from campgrounds, motel rooms, etc.
ORDER # R5015



Vertical Antenna Classics. Descriptions and construction information on vertical antennas. Vertical antenna theory and modeling for HF, VHF and UHF. Directional arrays, radials and ground systems, and more.
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ARRL Repeater Directory - NEW for 2001-2002

The latest listings from the U.S., U.S. territories, and Canada. CTCSS tone, DCS access control and frequency information for thousands of HF/VHF/UHF repeaters in a pocket sized reference book.
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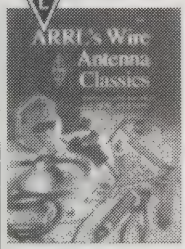
ARRL Antenna Classic Books



Wire Antenna Classics. An entire book devoted to wire antennas, from simple to complex. Includes articles on dipoles, loops, rhombics, wire beams and receive antennas. An ideal book for Field Day planners or the next wire antenna project at your home station.
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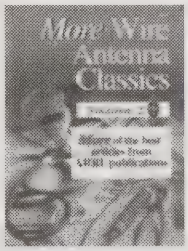
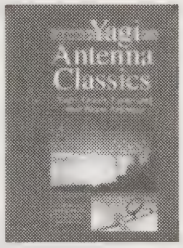


Wire Antennas Classics, volume 2. Filled with innovative wire antenna designs from the pages of QST and other ARRL publications. Experience the satisfaction and enjoy the benefits of building your own wire antennas.
ORDER # R5021



Physical Design of Yagi Antennas. by David Leeson W6QHS. A book concentrating on the physical properties of Yagi antennas. How to build them tough the first time so they'll stay up for many years to come.Tips for poor weather, wind problems, etc.
ORDER # R5011

Yagi Antenna Classics. Yagis, Quads, Loops and other Beam Antennas. Includes some of the very best articles written about beam antennas. Covers monobanders, multibanders, HF, VHF and UHF beams from 3.5 to 2304 MHz. Information on computer modeling, towers, masts and guys.
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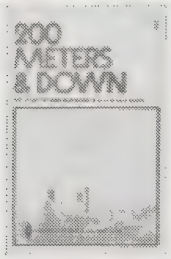
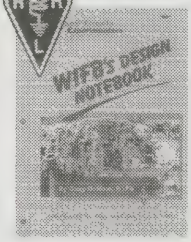


200 Meters and Down. The history of the early days of amateur radio from Marconi through the spark era and the dawn of CW operation on the 'useless' amateur radio frequencies above 200 meters.
ORDER # R5016



W1FB Design Notebook. Practical projects by Doug DeMaw, W1FB, that can be built using readily available components and common hand tools. Includes explanations of how circuits work without heavy mathematical analysis.
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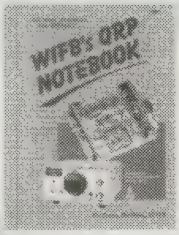

W1FB QRP Notebook. Looking for construction projects for QRP transmitters, receivers and accessories? This is the book. Projects for QRP that you can build and use on the air.
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Now You're Talking. ARRL study guide for the Technician class license exam. Easy to understand theory and rules explanations. Illustrations and photos. Entire exam question pool with answers and page references.
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Antenna Compendium Volume 6. All new articles covering low band antennas and operating, 10 meter antenna designs, multiband antennas, propagation and terrain assessment. Includes a CD-ROM with propagation prediction software.
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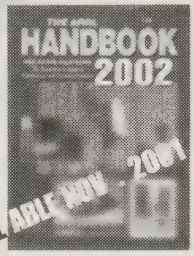

ARRL 2002 Handbook – . 79th edition. The standard reference book for radio amateurs, electronics technicians, and professional engineers. 1200 pages. Everything for the active radio amateur from operating techniques to advanced design theory is presented.
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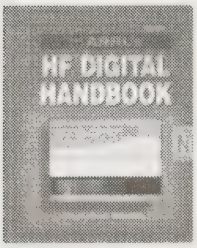
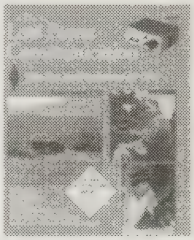


HF Digital Handbook. Operating tips on everything from traditional RTTY to modern digital modes like PSK31 and MFSK16. Internet e-mail via HF radio. Complete technical specifications of various digital modes.
ORDER # R5006

Log Book. Spiral bound. Entry columns for all relevant contact information such as date, time, band, mode, station worked, signal reports exchanged, name and QTH info and QSL card routing.
ORDER # R5007



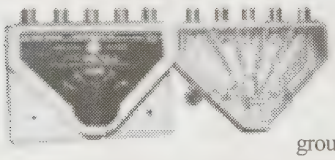
Low Power Communication. Tips on low power operating, selection of appropriate equipment, antennas, emergency operating, solar power and more. Written by Rich Arland, K7SZ.
ORDER # R5008

ON4UN's Low Band DXing. A must for DXers and contesters or casual operators who occasionally venture onto the low bands. The standard reference guide for operating techniques and antenna construction on the 40, 80, and 160 meter HF amateur bands.
ORDER # R5009

ARRL Operating Manual. The practical "how-to" book of ham radio. 400 pages. Operating basics, contest operation, digital modes, shortwave listening, VHF/UHF operation, FM operation, slow and fast scan television, DXing and more. Many charts and tables.Grid square maps, band plans, beam heading charts, CW abbreviations, etc.
ORDER # R5010

QRP Power. Crammed with projects you can build yourself for 5 watt and below operation. Loads of QRP resource information. QRP-related articles from QST, QEX and the ARRL Handbook are included.
ORDER # R5012

ALPHA DELTA

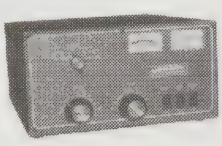


Delta-2 and Delta-4 coax switches.
Surge protected 2 position and 4 position coax switches using Alpha Delta's ARC-PLUG gas tube protection. Master antenna ground switch position. Low loss constant impedance micro-strip cavity design. Excellent co-channel isolation. Handles 1500 watts output power. Positive detent roller bearing switch drive. Usable to 500 MHz.
ORDER # R9201 DELTA 2 **ORDER # R9204 DELTA 4**

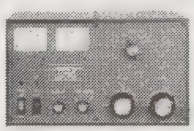
Delta 4C coax switch
Console version of the popular Delta-4 coax switch. Sits conveniently next to your station equipment with no wall or desk mounting required. The connector and console design prevents coax cable from pulling the console switch backward off of the operating table. Internal design is the same as the Delta-4 switch.
ORDER # R9205

AMERITRON

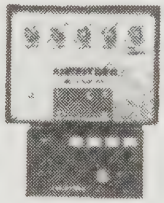
AL-811 and AL-811H linear amplifiers.
Compact desktop HF linear amplifier. 15 through 160 meters, 10 and 12 meter operation by user modification with proof of amateur radio license. 3 tube AL-811 at 600 watts SSB output and 4 tube AL-811H at 800 watts SSB output provides plenty of signal punch above a standard 100 watt HF transceiver. Uses 811A tubes in final amplifier. 17 pound power transformer, full wave bridge power supply. Pi-Network tuned input circuitry. Weight 30 pounds, measures 8" x 13.25" x 16" HWD.
ORDER # R4000 AL-811



ORDER # R4001 AL-811H



RCS-8V remote coax switch with control line
Switch up to 5 antennas on one coax cable remotely without placing 12 VDC on coax cable. Uses separate control cable for antenna switching. Rated for full legal limit output on HF, 1000 watts on 2 meters. Includes indoor control switching box and antenna connection box for outdoor mounting. Powered directly from 120 VAC. Requires 6 conductor control line (not supplied).
ORDER # R9207



.DL-1500 oil can dummy load
)il cooled 50 ohm 'paint can' dummy load handles 500 watts for 5 minutes, SWR under 1.2:1 up to 0 MHz. Low SWR to 400 MHz.
)RDER # R9612

We Accept: VISA • Mastercard • Discover

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1185 Dolly Parton Parkway
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Sales: (800) 833-7373
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9-5:30 Eastern Mon-Fri

RETAIL PRICE SCHEDULE – OTHER MANUFACTURERS

Effective September 24, 2001

TT p/n	Manufacturer	Item and Description	Retail Price
R9201	ALPHA DELTA	Delta-2 2 pos coax switch	49.94
R9204	ALPHA DELTA	Delta-4 4 pos coax switch	79.95
R9205	ALPHA DELTA	Delta 4C 4 pos console coax switch	139.95
R4000	AMERITRON	AL-811 amplifier	629.00
R4001	AMERITRON	AL-811H amplifier	749.00
R9207	AMERITRON	RCS8V remote coax switch w/control line	139.95
R9612	AMERITRON	ADL-1500 oil can dummy load	69.95
R3402	AMPHENOL	Amphenol PL259 connector	1.99
R3404	AMPHENOL	Amphenol UG176 RG8X reducer	0.80
R3405	AMPHENOL	Amphenol UHF "T" adapter	9.95
R3406	AMPHENOL	Amphenol UHF fem/fem barrel connector	3.99
R5000	ARRL	8101 License Manual: Extra Class	19.00
R5001	ARRL	8004 License Manual: General Class	15.00
R5002	ARRL	7873 License Manual: Tech Q&A	12.95
R5003	ARRL	7970 Now You're Talking – No Code Tech license manual	19.00
R5004	ARRL	7431 Antenna Compendium Vol 6	20.00
R5005	ARRL	1867 ARRL Handbook 2001 softcover	32.00
R5006	ARRL	7652 HF digital handbook	15.00
R5007	ARRL	1250 ARRL Log Book	5.00
R5008	ARRL	7334 Low Power Communication	14.95
R5009	ARRL	7040 ON4UN's Low Band DXing	28.00
R5010	ARRL	7938 ARRL Operating Manual 7th edition	25.00
R5011	ARRL	3819 Physical Design of Yagi Antennas	20.00
R5012	ARRL	5617 QRP Power	12.00
R5013	ARRL	8241 2001/02 Repeater Directory	9.00
R5014	ARRL	6834 Radio Frequency Interference	20.00
R5015	ARRL	7571 Stealth Amateur Radio	14.95
R5016	ARRL	0011 200 Meters and Down	8.00
R5017	ARRL	5218 Vertical Antenna Classics	12.00
R5018	ARRL	3207 W1FB Design Notebook	10.00
R5019	ARRL	3657 W1FB QRP Notebook	10.00
R5020	ARRL	7075 Wire Antenna Classics	14.00
R5021	ARRL	7709 Wire Antenna Classics vol 2	14.00
R5022	ARRL	8187 Yagi Antenna Classics	17.95
R9100	BENCHER	BY-1 Black base iambic paddle	99.95
R9101	BENCHER	BY-2 Chrome iambic paddle	109.95
R9104	BENCHER	RJ-1 Black base straight key	89.95
R1100	BUTTERNUT	HF2V 40/80 meter vertical	229.95
R1101	BUTTERNUT	HF6V 6 band vertical	319.95
R1102	BUTTERNUT	HF9V 9 band vertical	369.95
R1120	CABLE X-PERTS	DA20 20m dipole. Center insulator, #14 str. wire, dogbones	20.95
R1121	CABLE X-PERTS	DA1540 15/40m dipole. Center insulator, #14 str. wire, dogbones	21.95
R1122	CABLE X-PERTS	DA75 75m dipole. Center insulator, #14 str. wire, dogbones	23.95
R1123	CABLE X-PERTS	DA80 80m dipole. Center insulator, #14 str. wire, dogbones	24.95
R1124	CABLE X-PERTS	DA160 160m dipole. Center insulator, #14 str. wire, dogbones	29.95
R3006	CABLE X-PERTS	DOGBONES 10 pack porcelain end insulators	13.99
R3007	CABLE X-PERTS	DOGBONES single units porcelain end insulators	1.50
R3101	CABLE X-PERTS	3/32" black poly UV resistant rope 260# 100 ft.	7.50
R3102	CABLE X-PERTS	3/32" black poly UV resistant rope 260# 250 ft.	15.00
R3103	CABLE X-PERTS	3/32" black poly UV resistant rope 260# 500 ft	25.00
R3104	CABLE X-PERTS	3/16" black poly UV resistant rope 770# 100 ft	15.00
R3105	CABLE X-PERTS	3/16" black poly UV resistant rope 770# 250 ft	30.00
R3106	CABLE X-PERTS	3/16" black poly UV resistant rope 770# 500 ft	50.00
	CABLE X-PERTS	COAX CABLE. MIN. ORDER 50 FEET.	
R3201	CABLE X-PERTS	9913FX flexible stranded center 9913 coax cable	
		50-99 feet, per foot	0.70
		100-499 feet, per foot	0.60
		500+ feet, per foot	0.58
R3202	CABLE X-PERTS	18267 RG213/U coax cable	
		50-99 feet, per foot	0.50
		100-499 feet, per foot	0.40
		500+ feet	0.38

R3203	CABLE X-PERTS	18214 RG8U foam dielectric coax cable	
		50-99 feet, per foot	0.44
		100-499 feet, per foot	0.34
		500+ feet, per foot	0.32
R3204	CABLE X-PERTS	19258B RG8X small foam dielectric coax cable	
		50-99 feet, per foot	0.26
		100-499 feet, per foot	0.18
		500+ feet, per foot	0.16
R3211	CABLE X-PERTS	9913FC150 9913FX 150ft premade cable w/installed PL-259's	109.95
R3212	CABLE X-PERTS	9913FC100 9913FX 100ft premade cable w/installed PL-259's	76.95
R3213	CABLE X-PERTS	9913FC50 9913FX 50ft premade cable w/installed PL-259's	43.95
R3214	CABLE X-PERTS	9913FC25 9913FX 25ft premade cable w/installed PL-259's	26.95
R3215	CABLE X-PERTS	9913FC15 9913FX 15ft premade cable w/installed PL-259's	23.95
R3216	CABLE X-PERTS	9913FC6 9913FX 6ft premade cable w/installed PL-259's	14.95
R3217	CABLE X-PERTS	18267C150 RG213/U 150ft premade cable w/installed PL-259's	77.95
R3218	CABLE X-PERTS	18267C100 RG213/U 100ft premade cable w/installed PL-259's	55.95
R3219	CABLE X-PERTS	18267C50 RG213/U 50ft premade cable w/installed PL-259's	33.95
R3220	CABLE X-PERTS	18267C25 RG213/U 25ft premade cable w/installed PL-259's	22.95
R3221	CABLE X-PERTS	18267C15 RG213/U 15ft premade cable w/installed PL-259's	20.95
R3222	CABLE X-PERTS	18267C6 RG213/U 6ft premade cable w/installed PL-259's	13.95
R3223	CABLE X-PERTS	19258C100 RG8X 100ft premade cable w/installed PL-259's	29.95
R3224	CABLE X-PERTS	19258C50 RG8X 50ft premade cable w/installed PL-259's	22.95
R3225	CABLE X-PERTS	19258C25 RG8X 25ft premade cable w/installed PL-259's	16.95
R3226	CABLE X-PERTS	19258CC12 RG8X 12ft premade cable w/installed PL-259's	13.95
R3227	CABLE X-PERTS	19258CC6 RG8X 6ft premade cable w/installed PL-259's	11.95
R3228	CABLE X-PERTS	19258CC3 RG8X 3ft premade cable w/installed PL-259's	10.95
R3300	CABLE X-PERTS	14HD #14 stranded hard-drawn uninsulated copper antenna wire	
		Sold in multiples of 100 feet only.	
		100 feet, per foot	0.15
		200+ feet, per foot	0.12
	CABLE X-PERTS	Rotator and control cables. Sold in multiples of 50 feet.	
R3321	CABLE X-PERTS	1618 heavy duty rotor cable 2@16ga, 6@18ga (like Belden 9405)	
		50 feet, per foot	0.42
		100-500 feet, in 50 foot multiples only	0.37
		550-1000 feet, in 50 foot multiples only	0.36
R3322	CABLE X-PERTS	5971 light duty rotor cable 2@18ga, 6@22ga (like Belden 8448)	
		50 feet, per foot	0.27
		100-500 feet, in 50 foot multiples only	0.22
		550-1000 feet, in 50 foot multiples only	0.20
R3401	CABLE X-PERTS	PL-259 Silver/Teflon gold pin connector	0.99
R3403	CABLE X-PERTS	UG176 silver RG8X reducer	0.49
R3407	CABLE X-PERTS	6633S male N connector	4.80
R3408	CABLE X-PERTS	279108 BNC male crimp-on connector	1.80
R3409	CABLE X-PERTS	306 UHF female to BNC male adapter	2.80
R3410	CABLE X-PERTS	421 UHF female to RCA male adapter	2.80
R3411	CABLE X-PERTS	1575 SMA male to UHF female adapter	5.95
R3412	CABLE X-PERTS	RFU536 UHF fem/fem barrel connector	1.79
R3500	CABLE X-PERTS	104 Coax Seal	3.89
R2102	COMET	Comet CA-ABC 22A 2m aluminum base antenna	69.95
R2106	COMET	Comet GP-3 2m/70cm fiberglass base antenna	99.95
R2107	COMET	Comet GP-6 2m/70cm fiberglass base antenna	139.95
R2108	COMET	Comet GP-9 2m/70cm fiberglass base antenna	179.95
R2109	COMET	Comet GP-15 6m/2m/70cm fiberglass base antenna	149.95
R2202	COMET	Comet SBB-25NMO 2m NMO mount mobile ant 57"	44.95
R2207	COMET	Comet B-10NMO 2m/70 cm NMO mount mobile ant 12"	39.95
R2208	COMET	Comet B-20NMO 2m/70cm NMO mount mobile ant 30"	49.95
R2209	COMET	Comet SBB-5NMO 2m/70 cm NMO mount mobile ant 38"	54.95
R2210	COMET	Comet SBB-7NMO 2m/70 cm NMO mount mobile ant 55"	74.95
R2502	COMET	Comet BNC-24 17" ultrathin 2m/70cm HT antenna BNC	22.95
R9005	DAIWA	Daiwa CN-101HF/2m SWR/pwr mtr 200w	99.95
R9006	DAIWA	Daiwa CN-801H SWR/pwr mtr HF/2m 2 kW	139.95
R9203	DAIWA	Daiwa CS-201A 2 pos coax switch	26.95
R2103	DIAMOND	CP22E 2m aluminum vertical antenna	59.95
R2104	DIAMOND	F22A 2m fiberglass vertical antenna	99.95
R2110	DIAMOND	X50A 2m/70cm fiberglass vertical antenna	99.95
R2111	DIAMOND	X200A 2m/70cm fiberglass vertical antenna	139.95
R2112	DIAMOND	X510MA 2m/70cm fiberglass vertical antenna	189.95
R2114	DIAMOND	X3200A 144/220/440 MHz fiberglass vertical antenna	209.95
R2115	DIAMOND	V2000A 6m/2m/70cm fiberglass vertical antenna	149.95
R2203	DIAMOND	NR2C 2m mobile antenna "UHF" connector	39.95
R2211	DIAMOND	NR770HA 2m/70cm mobile antenna "UHF" connector	56.95
R2212	DIAMOND	NR770HB like NR770HA, only black	59.95
R2213	DIAMOND	SG7500A 2m/70cm mobile antenna "UHF" connector	79.95
R2401	DIAMOND	MX62M 6/2 meter duplexer	74.95
R9000	DIAMOND	SX-200 1.8-200 MHz 200w SWR/pwr meter	89.95
R9001	DIAMOND	SX-600 1.8-160/140-525 200w SWR/pwr meter	169.95
R9002	DIAMOND	SX-20C mobile SWR/pwr meter HF/6m/2m 300 watts	89.95
R9003	DIAMOND	SX-40C mobile SWR/pwr meter 144-470 MHz 150 watts	79.95

R1222	HUSTLER	MO-2 54" fold over aluminum mobile mast	31.95
R1200	HUSTLER	MO-3 54" mobile mast	23.95
R1201	HUSTLER	MO-4 22" mobile mast	19.95
R1202	HUSTLER	RM-10 10m resonator	15.95
R1203	HUSTLER	RM-10-S 10m super resonator	23.95
R1204	HUSTLER	RM-15 15m resonator	15.95
R1205	HUSTLER	RM-15-S 15m super resonator	24.95
R1224	HUSTLER	RM-17 17m resonator	21.95
R1206	HUSTLER	RM-20 20m resonator	21.95
R1207	HUSTLER	RM-20-S 20m super resonator	28.95
R1208	HUSTLER	RM-40 40m resonator	24.95
R1209	HUSTLER	RM-40-S 40m super resonator	35.95
R1210	HUSTLER	RM-75 75m resonator	26.95
R1211	HUSTLER	RM-75-S 75m super resonator	49.95
R1212	HUSTLER	RM-80 80m resonator	26.95
R1213	HUSTLER	RM-80-S 80m super resonator	49.95
R2312	HUSTLER	QD-2 quick disconnect	19.95
R2314	HUSTLER	SSM-1 ball mount + spring	46.95
R2315	HUSTLER	SSM-2 ball mount	26.95
R2316	HUSTLER	SSM-3 3/8 x 24 spring	24.95
R1223	HUSTLER	VP-1 three band resonator adapter	5.95
R1214	LAKEVIEW	9110 10m Hamstick mobile antenna	24.95
R1215	LAKEVIEW	9112 12m Hamstick mobile antenna	24.95
R1216	LAKEVIEW	9115 15m Hamstick mobile antenna	24.95
R1217	LAKEVIEW	9117 17m Hamstick mobile antenna	24.95
R1218	LAKEVIEW	9120 20m Hamstick mobile antenna	24.95
R1219	LAKEVIEW	9130 30m Hamstick mobile antenna	24.95
R1220	LAKEVIEW	9140 40m Hamstick mobile antenna	24.95
R1221	LAKEVIEW	9175 75m Hamstick mobile antenna	24.95
R1225	LAKEVIEW	TW-1 47 inch replacement whip	5.95
R2105	LAKEVIEW	GP-10-2 1/4 wave 2m base antenna	13.95
R2113	LAKEVIEW	DBB-5 146/446 MHz base antenna	34.95
R2200	LAKEVIEW	9002 2m 3/4 wave mob antenna for 3/8" x 24 mounts	12.95
R2201	LAKEVIEW	M-100 5/8 wave 2 meter mag mount antenna	29.95
R2204	LAKEVIEW	EDB-1 146/440 MHz mobile ant, w/coax + PL259	16.95
R2205	LAKEVIEW	EDB-2 146/440 MHz mobile ant, w/coax + BNC	16.95
R2206	LAKEVIEW	OTG-270 146/446 MHz on glass mobile antenna	39.95
R2300	LAKEVIEW	243 flat bar 3/8" x 24 thread mobile mount	13.95
R2301	LAKEVIEW	015A 3/8" x 24 thread no hole trunk lip mount	13.95
R2302	LAKEVIEW	276 4 bolt 3/8" x 24 thread mobile mount	9.95
R2303	LAKEVIEW	901 rotatable dipole mount for Hamsticks	13.95
R2304	LAKEVIEW	BC-1 bumper clip 3/8" x 24 thread mount	10.95
R2305	LAKEVIEW	372+ mag mount w/coax for "UHF" mount mobile ants	23.95
R2306	LAKEVIEW	T+ trunk lip mount w/coax for "UHF" mount mobile ants	16.95
R2307	LAKEVIEW	375 Tri-Mag mount for 3/8" x 24 thread mobile antennas	39.95
R2308	LAKEVIEW	T-NMO no hole trunk lip mount for NMO mount antennas	16.95
R2309	LAKEVIEW	276-NMO 4 bolt NMO mobile mount	16.95
R2310	LAKEVIEW	F-NMO two screw NMO mag mount	16.95
R2311	LAKEVIEW	NMO-1 mag mount w/coax and PL-259 for NMO mount antennas	18.95
R2317	LAKEVIEW	235 3/8" x 24 spring (like Hustler SSM-3)	11.95
R2318	LAKEVIEW	RC-1 NMO mount rain cap	2.95
R2319	LAKEVIEW	075 ball mount + spring (like Hustler SSM-1)	21.95
R2413	LAKEVIEW	009HD 3/8" x 24 thread antenna quick disconnect	6.95
R2500	LAKEVIEW	D-2 2m HT antenna 12" high	12.95
R2501	LAKEVIEW	D-27 2m/440 HT antenna 12" high	24.95
R4100	LDG	LDG AT-11MP 150 watt automatic antenna tuner	239.00
R4101	LDG	LDG Z-11 QRP 15 watt automatic antenna tuner	179.00
R9106	LOGIKEY	Logikey K-3 CW keyer	129.95
	M2	M2 antennas. VHF antennas are generally available from stock. HF yagis are stock or can be drop shipped direct to customer from M2. Contact Ten-Tec for availability and shipping quotes.	
R2000	M2	6M3 3 el 50 MHz yagi antenna	129.00
R2001	M2	6M5 5 el 50 MHz yagi antenna	199.00
R2002	M2	6M7JHV 7 el 50 MHz yagi antenna	269.00
R2003	M2	2M7 7 el 144 MHz yagi antenna	119.00
R2004	M2	2M12 12 el 144 MHz yagi antenna	169.00
R2005	M2	2M5WL 17 el 144 MHz yagi antenna	219.00
R2100	M2	6M HO Horizontal Omni Loop	99.00
R2101	M2	2M HO Horizontal Omni Loop	44.00
	M2	20M4DX 4 el 20m monobander	499.00
	M2	17M5DX 5 el 17m monobander	499.00
	M2	17M3DX 3 el 17m monobander	379.00
	M2	15M4DX 4 el 15m monobander	419.00
	M2	12M4DX 4 el 12m monobander	379.00
	M2	10M4DX 4 el 10m monobander	379.00
	M2	KT36XA heavy duty HF tribander	1239.00
R2503	MALDOL	Maldol AS-20 9" ultrathin 2m/70cm HT antenna SMA	26.95
R2504	MALDOL	Maldol AS-30 16" ultrathin 2m/70cm HT antenna SMA	29.95
R2505	MALDOL	Maldol MH-209 2m/70cm 3" HT ant BNC	22.95
R2506	MALDOL	Maldol MH-209A 2m/70cm 3" HT ant SMA	23.95

R2402	MFJ	MFJ 916 2m/440 duplexer	29.95
R3107	MFJ	MFJ 1910 fiberglass 33' telescoping mast	79.95
R4102	MFJ	MFJ 901B T network antenna tuner	69.95
R4103	MFJ	MFJ 941E antenna tuner w/metering	109.95
R4104	MFJ	MFJ 949E Versa Tuner II	129.95
R4105	MFJ	MFJ 969 300 w roller inductor antenna tuner	189.95
R9004	MFJ	MFJ 815B 2000w power meter	74.95
R9103	MFJ	MFJ 564B black base "Bencher style" paddle	49.95
R9105	MFJ	MFJ 434 Contest voice keyer	169.95
R9202	MFJ	MFJ 1702C 2 pos coax switch	25.95
R9206	MFJ	MFJ 1704 4 pos coax switch	63.95
R9400	MFJ	MFJ 295Y Yaesu HT speaker mic	15.95
R9401	MFJ	MFJ 295I Icom HT speaker mic	15.95
R9402	MFJ	MFJ 295K Kenwood HT speaker Mic	15.95
R9500	MFJ	MFJ 259B SWR Analyzer	219.95
R9510	MFJ	MFJ 105C 24 hr wall clock	19.95
R9511	MFJ	MFJ 107B 24 hour LCD clock	9.95
R9512	MFJ	MFJ 108B 12/24 hour dual LCD clock	19.95
R9600	MFJ	MFJ 1112 unmetered 15A DC dist panel	34.95
R9601	MFJ	MFJ 1116 metered fused 15A DC dist panel	49.95
R9602	MFJ	MFJ 1315 power supply for 259B or MFJ tuner lighting	14.95
R9610	MFJ	MFJ 260C 300w dummy load	34.95
R9611	MFJ	MFJ 264 1.5 kW dry dummy load	69.95
R9620	MFJ	MFJ 392 headphones	19.95
R9630	MFJ	MFJ 281 ClearTone speaker	12.95
R4002	MIRAGE	A1015G 6m linear amp 10w in/150w out	359.95
R4003	MIRAGE	B1016G 2m linear amp 10w in/160w out	349.95
R4004	MIRAGE	B2518G 2m linear amp 25w in/160w out	299.95
R9300	PRECISION PROD	1133 pencil soldering iron w/stand	5.95
R9301	PRECISION PROD	1134A crimping, cutting, wire stripping tool	3.95
R9302	PRECISION PROD	3110 soldering station helping hands w/magnifier + iron holder	9.95
R9303	PRECISION PROD	3108 soldering station helping hands w/magnifier	7.95
R1125	RADIO WORKS	Carolina Windom 40, 40-10 meters	90.00
R1126	RADIO WORKS	Carolina Windom 80, 80-10 meters	95.00
R1127	RADIO WORKS	Carolina Windom 160, 160-10 meters	135.00
R3001	RADIO WORKS	B1-2K 1.5 kW 1:1 balun	24.95
R3002	RADIO WORKS	B1-5K 5 kW 1:1 balun	35.95
R3003	RADIO WORKS	B4-2KX 4:1 balun	49.95
R3004	RADIO WORKS	T-4 line isolator balun	34.95
R3005	RADIO WORKS	T-4G line isolator balun w/ground strap	38.95
R9900	RADIO WORKS	#31 .5" I.d. snap on ferrite RF chokes	4.00
R9621	WGA	TR-2000 headphone/boom mic wired for Ten-Tec rigs	76.95
R9622	WGA	PTT-2000 PTT button for TR-2000	14.95
R9623	WGA	FT-2000 footswitch for TR-2000	19.95

PAYMENT: We accept VISA, MASTERCARD, and DISCOVER. Please provide complete name, account number, and expiration date. Money orders, cashier's check, and personal checks also accepted. Please note personal checks may require up to 10 days to clear before shipment is made. Sorry, but we do not accept COD orders. TN. residents add 8.5% sales tax.

SHIPPING: We have a minimum shipping and handling charge of $6.50 on all orders. Most shipments are made by UPS surface. Mail services, UPS air shipping and Federal Express are also available by quotation. Shipment based on weight/and or dimensional charges for large light items (like HF mobile antennas).

Visit our Internet Store 24 hours a day

www.tentec.com

Please note! Many of the items listed on this price sheet are not yet available directly through our Internet store. We expect to have all items on-line by the end of September 2001. Orders may be placed immediately for all items listed on this price sheet by calling (800) 833-7373, 9-5:30 EST Mon-Fri.

all prices subject to change without notice

AMPHENOL

CABLE CONNECTORS

PL-259 connectors:
Amphenol nickel-plated PL-259.
ORDER # R3402
Cable X-Perts silver plated/gold pin PL-259.
ORDER # R3401

RG8X reducers for PL-259 connectors:
Amphenol UG176 (silver)
ORDER # R3404
Cable X-Perts UG176 (silver)
ORDER # R3403

UHF female/female barrel connectors (SO-239 style on each side, for connecting two PL-259 connectors together)
Amphenol 831J
ORDER # R3406
Cable X-Perts RFU536
ORDER # R3412

UHF "T" connectors
three SO-239 female connectors
Amphenol 831T
ORDER # R3405

BENCHER

BY-1 Black Iambic paddle.
Black base, chrome components. Steel base with non-skid feet. Responsive, light touch CW keying from a true iambic paddle. Wide range of tension adjustments. Precision machine components, gold plated sold silver contact points.
ORDER # R9100

BY-2 Chrome Iambic paddle.
Same construction as BY-1, only has a chrome base instead of black.
ORDER # R9101

RJ-1 Straight Key.
Black base, chrome components. Bronze bearing pivots points. Black "Navy" style knob. Steel base with non-skid feet.
ORDER # R9104

Bencher "Skyhawk" 10 element HF tri-band (10, 15, 20 meters) Yagi antenna.
Also usable with reduced performance on 12 and 17 meters. Full sized monobander performance, consistent with boom length. Trapped triband antennas don't approach this performance level. All stainless steel hardware. Computer-optimized trap-free design assures maximum bandwidth, reduced wind loading, and no loss or blown trap problems that plague trapped Yagi antennas. Torque balanced for minimization of rotator wear. The Bencher Skyhawk can be ordered through Ten-Tec and is drop shipped directly to the customer from the Bencher facility in Illinois. UPS shippable.

BUTTERNUT

HF2V 40m/80m vertical antenna.
32 feet height. Can be roof, mast, or ground mounted. Requires no guying. Low radiation angle makes it an excellent choice for low band DXing.
ORDER # R1100

HF6V Vertical antenna for 80/40/30/20/15/10 meters.
26 feet high. An efficient radiator that takes up very little space. Easy to build and tune. No lossy traps! Requires radials, or use with optional CPK counterpoise kit for no-radial operation. 160 meters can be added with optional TBR-160-S 160 meter resonator kit.
ORDER # R1101

HF9V Vertical antenna for 80/40/30/20/17/20/15/12/10 meters. 26 feet high. An efficient radiator that takes up very little space. Easy to build and tune. No lossy traps! Requires radials, or use with optional CPK counterpoise kit for no-radial operation. 160 meters can be added with optional TBR-160-S 160 meter resonator kit.
ORDER # R1102

CABLE X-PERTS

All Cable X-Perts pre-built dipole antennas use #14 copper 7 strand wire and are supplied with center insulator, coax adapter and porcelain end insulators. Add coaxial feedline and you're ready to install.

Part #	Frequency Coverage	Total Span	Center Frequency	ORDER#
Model **DA20**	(20 meters.)	34 feet total length.	14.100	**R1120**
Model **DA1540**	(15 and 40 meters.)	65 feet total length.	21.000 and 7.100	**R1121**
Model **DA75**	(75 meters.)	126 feet total length.	3.900	**R1122**
Model **DA80**	(80 meters.)	130 feet total length.	3.600	**R1123**
Model **DA160**	(160 meters.)	260 feet total length.	1.825	**R1124**

WIRE AND ANTENNA CONSTRUCTION ITEMS

DOG BONES – 2.5" length porcelain antenna insulators. Available in discount packages of 10 or as single quantities.
ORDER # R3006 -10 pk
ORDER # R3007- single pk

14HD #14 stranded uninsulated copper antenna wire.
The standard for ham radio use.
Sold in lengths of 100, 300, 500, or 1000 feet.
ORDER # R3300

Coax Seal – Protects exposed connections from moisture and corrosion. Flexible, can beformed and sealed over odd shaped or difficult coax fittings. Non-contaminating, non-conductive.
ORDER # R1102

Antenna support rope. We offer two Cable X-Perts versions at 3/16" and 3/32". Mildew and abrasion resistant, strong double braid construction, black polyester jacket for Ultra-Violet protection and log life. Ties easily, no extra hardware required. Test strength for 3/16" is 770 pounds, 3/32" is 260 pounds. Each version of rope is available in precut lengths of 100, 250, or 500 feet.

3/32"
ORDER # R3101 -100 ft.
ORDER # R3102- 250 ft.
ORDER # R3103 -500 ft.

3/16"
ORDER # R3104 -100 ft.
ORDER # R3105 250 ft.
ORDER # R3106 -500 ft.

MORE CABLE X-PERTS.....

COAXIAL CABLE -

We offer four different Cable X-Perts 50 ohm low loss coaxial cables. Coaxial cable is sold "cut to order" by the foot. Minimum order is 50 feet for any one piece of cable.

9913FX – Flexible "9913 style" RG8/U coax. 2 shields, 95% tinned copper and bonded aluminum foil shield. Semi solid polyethylene dielectric. Black, non-contaminating direct burial jacket usable from –40 to +85 degrees Celsius. 84% velocity factor. Frequency attenuation per 100 ft @ 30 MHz 0.8 dB, @ 150 MHz 1.6 dB, @ 450 MHz 2.8 dB. Accepts PL-259 connectors.
ORDER # R3201

18267 RG213/U – Single shield, 97% bare copper. Solid polyethylene dielectric. Black, non-contaminating direct burial jacket usable from –40 to +85 degrees Celsuis. 66% velocity factor. Frequency attenuation per 100 ft @ 30 MHz 1.2 dB, @ 150 MHz 2.8 dB, @ 450 MHz 5.2 dB. Accepts PL-259 connectors.
ORDER # R3202

18214 RG8/U - Single shield, 97% bare copper. Foam polyethylene dielectric. Black, UV resistant PVC jacket usable from –40 to +80 degrees Celsius. 78% velocity factor. Frequency attenuation per 100 ft @ 30 MHz 0.9 dB, @ 150 MHz 2.3 dB, @ 450 MHz 4.7 dB. Accepts PL-259 connectors.
ORDER # R3203

19258B RG8X – Single shield, 95% bare copper.
Foam polyethylene dielectric. Black, UV resistant PVC jacket usable from –40 to +80 degrees Celsius. 80% velocity factor. Frequency attenuation per 100 ft @ 30 MHz 2.0 dB, @ 150 MHz 4.7 dB, @ 450 MHz 8.6 dB. Accepts PL-259 connectors when used with UG176 reducer.
ORDER # R3204

9913FX### Flexible "9913 style" RG8/U coax.
Prebuilt cables with PL-259's available in lengths of 150, 100, 50, 25, 15, and 6 feet.

ORDER # R3211 -150'
ORDER # R3212 -100'
ORDER # R3213 -50'
ORDER # R3214 -25'
ORDER # R3215 -15'
ORDER # R3216 -6'

19258C### RG8X coax.
Prebuilt cables with PL-259's. clear jacketed. .available in lengths of 100, 50, and 25,feet with black jacket. 12, 6, and 3ft. with clear jacket.

ORDER # R3223 -100'
ORDER # R3224 -50'
ORDER # R3225 -25'
ORDER # R3226 -12'
ORDER # R3227 -6'
ORDER # R3228 -3'

18267C### RG213/U coax.
Prebuilt cables with PL-259's available in lengths of 150, 100, 50, 25, 15, and 6 feet.

ORDER # R3217 -150'
ORDER # R3218 -100'
ORDER # R3219 -50'
ORDER # R3220 -25'
ORDER # R3221 -15'
ORDER # R3222 -6'

COAXIAL CABLE CONNECTORS AND ADAPTERS

Cable X-Perts 306 UHF female to BNC male adapter. Commonly used to adapt VHF handheld antenna connectors to coaxial cable equipped with PL-259.
ORDER # R3409

Cable X-Perts 6633S male "N" connectors. Suitable for VHF/UHF use, installable on 9913FX or RG213/U coaxial cables.
ORDER # R3407

Cable X-Perts SMA male to UHF female. Makes connections to VHF HT's equipped with SMA antenna connectors a snap for PL-259 equipped coaxial cables.
ORDER # R3411

Cable X-Perts 279108 BNC male 'crimp-on' connector. Fits RG8X coaxial cable. Commonly used for VHF handheld radios or QRP HF transceivers.
ORDER # R3408

Cable X-Perts 421 UHF female to RCA male adapter.
ORDER # R3410

ROTATOR AND CONTROL CABLES

We offer two Cable X-Perts multi-conductor cables suitable for rotator or switching control line use. Each are sold in multiples of 50 feet only.

1618 rotator cable – similar to Belden #9405. This is a 'heavy duty' rotator cable designed for very long runs and/or higher current capacity. 8 wire cable with 2 16 gauge and 6 18 gauge conductors. Black UV resistant PVC jacketing. 0.346 inch outer diameter.
ORDER # R3321

5971 rotator cable – similar to Belden #8448. Light gauge rotator cable acceptable for runs of less than 200 feet. 8 wire cable with 2 18 gauge and 6 22 gauge conductors. Black UV resistant PVC jacketing. 0.26 inch outer diameter.
ORDER # R3322

DIAMOND ANTENNAS

CP22E. The CP22E is a high-gain 2 meter monoband aluminum vertical antenna. 6.5 dB gain, encapsulated matching network for weather protection, Stainless steel mounting hardware. 144-148 MHz, UHF ('SO-239') connector, 200 watts power rating, 8.9 feet high. Element phasing 2 x 5/8 wave.
ORDER # R2103

X200A. High-gain fiberglass 2m./70cm. vertical antenna utilizing waterproof joint couplings and stainless steel hardware. 144-148 MHz and 440-450 MHz, 6.0/8.0 dBi gain, UHF ('SO-239') connector, 200 watts power rating, 8.3 feet high. Element phasing 2 x 5/8 wave on 2 meters, 4 x 5/8 wave on 70 cm.
ORDER # R2111

F22A. High-gain fiberglass 2 meter vertical antenna utilizing waterproof joint couplings and stainless steel hardware. 144-148 MHz, 6.7 dBi gain, UHF ('SO-239') connector, 200 watts power rating, 10.5 feet high. Element phasing 2 x 5/8 wave.
ORDER # R2104

X510MA. Very high-gain fiberglass 2m./70cm. vertical antenna utilizing waterproof joint couplings and stainless steel hardware. 144-148 MHz and 440-450 MHz, 8.3/11.7 dBi gain, UHF ('SO-239') connector, 200 watts power rating, 17.2 feet high. Element phasing 3 x 5/8 wave on 2 meters, 8 x 5/8 wave on 70 cm.
ORDER # R2112

X50A. High-gain fiberglass 2m./70cm. vertical antenna utilizing waterproof joint couplings and stainless steel hardware. 144-148 MHz and 440-450 MHz, 4.5/7.2 dBi gain, UHF ('SO-239') connector, 200 watts power rating, 5.6 feet high. Element phasing 3 x 1/4 wave on 2 meters, 3 x 5/8 wave on 70 cm.
ORDER # R2110

X3200A. High-gain fiberglass 2m/1.25m/70cm. vertical antenna utilizing waterproof joint couplings and stainless steel hardware. 146-148, 222-225, and 440-450 MHz, 6.0/7.8/8.0 dBi gain, UHF ('SO-239') connector, 200 watts power rating, 10.5 feet high. 3/4 wave on 2 meters, 3 x 5/8 wave on 1.25m, 3 x 5/8 wave on 70 cm.
ORDER # R2114

V2000A. High-gain fiberglass 6m/2m/70cm vertical antenna utilizing waterproof joint couplings and stainless steel hardware. 2.15/6.0/8.0 dBi gain, UHF ('SO-239') connector, 150 watts power rating, 8.3 feet high. Element phasing 1/4 wave on 6 meters, 2 x 5/8 wave on 2 meters, 4 x 5/8 wave on 70 cm.
ORDER # R2115

We Accept: VISA • Mastercard • Discover

DIAMOND ANTENNAS

Diamond "fold over": Select Diamond VHF and VHF/UHF mobile antennas incorporate a "fold over" feature which will allow lowering of an installed antenna without removing it from the mount (ideal for pulling a car into a garage with a mobile antenna installed). Simply pull directly upwards on the antenna, and fold over equipped antennas will separate from the mount and can be laid down horizontally without removing the antenna from the mount. Fold over point is 4 to 6 inches above the mounting point.

NR2C 144 MHz mobile antenna. UHF female connector for connection to mount. Diamond "fold over". 55 inches tall, 4.1 dB gain. 150 watts power rating. Silver colored.
ORDER # R2203

NR770HA 144/440 MHz mobile antenna. UHF female connector for connection to mount. Diamond "fold over". 40 inches tall, 3.0/5.5 dB gain. 200 watts power rating. Silver colored.
ORDER # R2211

NR770HB Same antenna as NR770HA, only black.
ORDER # R2212

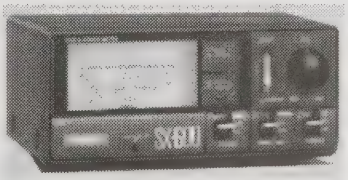
SG7500A 144/440 MHz mobile antenna. UHF female connector for connection to mount. Diamond "fold over". 41 inches tall, 4.1 dB gain. 150 watts power rating.
ORDER # R2213

DIAMOND ACCESSORIES:

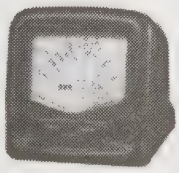
MX62M duplexer. 50 and 144 MHz. Allows connection of two separate 2 and 6 meter transceivers, or a dual band 50+144 MHz transceiver (like the Ten-Tec 526 VHF) to the same 50+144 MHz antenna. 600 watts PEP power rating. PL-259 connectors for connection to transceiver, SO-239 output connector to antenna. Insertion loss less than .3 dB.
ORDER # R2401

SX-200 1.8-200 MHz 200 watt peak reading SWR/power meter. Power metering selectable in three ranges of 5, 20, and 200 watts. SO-239 connectors. Illuminated meter (requires 12VDC @ 50 mA), switchable average or peak power output measurement, HWD 2"x6"x4", 2 pounds.
ORDER # R9000

SX-600 1.8-160 and 140-525 MHz 200 watt peak reading SWR/power meter. Power metering selectable in three ranges of 5, 20, and 200 watts. Directional couplers with switch and LED indicators to allow connection of two transceivers at the same time. SO-239 connectors. Illuminated meter (requires 12VDC @ 50 mA), switchable average or peak power output measurement, HWD 2"x6"x4", 2 pounds.
ORDER # R9001



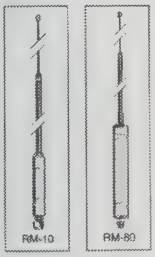
SX-20C 3.5-30, 50-54, 130-150 MHz 300 watt average reading wattmeter. Small, compact design ideal for use in mobile or limited space applications. Cross needle design allows for simultaneous monitoring of SWR and output power. 30 and 300 watt power switchable power output measuring scales.
ORDER # R9002



SX-40C Similar to SX-20C. 144-470 MHz only, 150 watts. Switchable 15 or 150 watt power output measuring scales.
ORDER # R9003

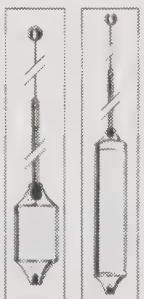
HUSTLER MOBILE ANTENNAS & ACCESSORIES

Standard resonators, 400 watt power rating.



Model	Band	Approx 2:1 SWR bandwidth
RM-10	10 meters	150-250 kHz
ORDER # R1202		
RM-15	15 meters	100-150 kHz
ORDER # R1204		
RM-20	20 meters	80-100 kHz
ORDER # R1206		
RM-40	40 meters	40-50 kHz
ORDER # R1208		
RM-75	75 meters	25-30 kHz
ORDER # R1210		
RM-80	80 meters	25-30 kHz
ORDER # R1212		

Super resonators. Rated for 1500 watts output power. Super resonators also feature wider bandwidth, particularly on 40, 75, and 80 meters.



Model	Band	Approx 2:1 SWR bandwidth
RM-10S	10 meters	250-400 kHz
ORDER # R1203		
RM-15S	15 meters	150-200 kHz
ORDER # R1205		
RM-20S	20 meters	100-150 kHz
ORDER # R1207		
RM-40S	40 meters	50-80 kHz
ORDER # R1209		
RM-75S	75 meters	50-60 kHz
ORDER # R1211		
RM-80S	80 meters	50-60 kHz
ORDER # R1213		

MO-3 Aluminum mounting mast, 54" high with white vinyl coating, to fit all Hustler resonators. Stainless steel base threaded to fit all Hustler and other 3/8" x 24 ball mounts.
ORDER # R1200

SSM-1 "Professional" ball mount and stainless steel spring for use with Hustler and other 3/8" x 24 thread antennas. Supplied with mounting hardware and cork pad.
ORDER # R2314

SSM-2 3/8 x 24" ball mount
ORDER # R2315

SSM-3 Stainless steel spring with coupling stud for base of 3/8" x 24 antennas
ORDER # R2316

QD-2 Quick disconnect for 3/8" x 24 thread antennas. Allows quick removal of antenna from mount without unscrewing connections.
ORDER # R2312

MO-4 Shortened aluminum mounting mast, 22" high, suitable for trunk or deck mounting, includes three new tip rods for resonator extension.
ORDER # R1201

SALES Department.1-800-833-7373 9am to 5:30pm EST • Monday - Friday www.tentec.com

Mobile antennas, accessories, hardware

Hamstick mobile antennas. Two-piece monoband antennas consisting of a hollow fiberglass base section approximately 1/2" in diameter with the loading coil wound directly on the fiberglass and covered with PVS shrink tubing. Base fitting has 3/8" x 24 threads that fit most amateur radio mobile mounts. Top section is a tapered, tempered stainless steel whip that telescopes into the base section for frequency adjustment. The assembled, adjusted antenna will be approximately 7 feet long. High vehicle mounting is not a problem as the antenna is very resilient and will withstand abuse that would destroy metal antennas. No spring or guy wiring is required.

Model	Band	Approx 2:1 SWR bandwidth	Model	Band	Approx 2:1 SWR bandwidth
9110	10 meters	1 MHz	9120	20 meters	175 kHz
ORDER # R1214			**ORDER # R1218**		
9112	12 meters	entire band	9130	30 meters	entire band
ORDER # R1215			**ORDER # R1219**		
9115	15 meters	350 kHz	9140	40 meters	60 kHz
ORDER # R1216			**ORDER # R1220**		
9117	17 meters	entire band	9175	75 meters	10 kHz
ORDER # R1217			**ORDER # R1221**		

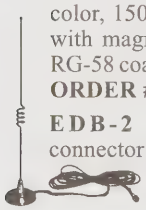
GP-10-2 144 MHz 1/4 wave base antenna. Economy priced unity gain 2 meter antenna. Aluminum mount and elements. Fits 1"-1.5" masts. All mounting hardware is included. Ready to connect to PL-259 equipped coax feedlines. 19 inches height.
ORDER # R2105

DBB-5 146/446 MHz base station antenna. Economy priced dual band VHF/UHF antenna. Aluminum construction. 40" height. 3.7/6.0 dB gain. 150 power rating. Ready to connect to PL-259 equipped coax feedlines. Similar to hamstick.
ORDER # R2113

9002 144 MHz 3/4 wave mobile antenna. Pre-tuned, 3 dB gain. 52 inches height. Stainless steel whip. Uses common 3/8" x 24 thread connection to mount. Rated to 500 watts.
ORDER # R2200

M-100 144 MHz 3/4 wave magnetic mount antenna. Economy priced. 49 inches height. 5/8 wave, 3 dB gain. Stiff stainless steel tapered whip. Equipped with extra strong 3" magnet, 15 ft. of RG-58 with PL-259 already attached to base. Rated to 150 watts.
ORDER # R2201

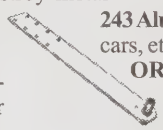
EDB-1 146/440 MHz mobile antenna, 19 inches tall. Economy priced. Black whip color, 150 watts power rating. Equipped with magnet at base of antenna, 15 feet RG-58 coax with PL-259 already installed.
ORDER # R2204



EDB-2 Same as EDB-1, except connector attached in place of PL-259
ORDER # R2205

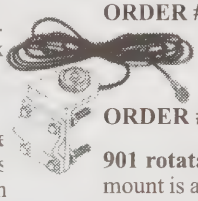
OTG-270 Dual band 144/440 MHz 'on-glass' mounted antenna. Rated for 60 watts output power. Onlay 25.5" tall. Complete instructions, all mounting hardware. RG-58 coax and connectors are included.
ORDER # R2206

015A Trunk Mount Assembly mount. Attaches to underside edge of trunk lid by means of two set screws. Complete with 15' coax cable with connector installed and all hardware needed for mount. Ideal for use with Hamsticks and other smaller 3/8" x 24 thread mobile antennas.
ORDER # R2301

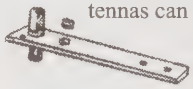


243 Aluminum flat bar mount. For fiberglass cars, etc. 3/8" x 24 mount. 14" inches long.
ORDER # R2300

276 4 bolt 3/8" mobile mount. Heavy duty 3/8" x 24 thread antenna mount. Installation piece can be mounted horizontally or vertically for vertical installation of antenna on vehicle. Ideal for outside rear view mirror mounting or conversion van rear ladder use. Includes 15 feet RG58 coax with PL-259 installed.
ORDER # R2302



276-NMO Same mount as 276, only for NMO antennas.
ORDER # R2309



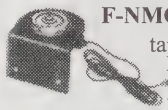
901 rotatable dipole mount. This unique mount is a flat aluminum bar with 3/8" x 24 threads mounted on each side. Two 'Hamstick' antennas or similar mobile antennas can be connected to each side of the aluminum bar and mounted horizontally for use as a portable dipole antenna. Can be mounted on a mast up to 1.5" in diameter.
ORDER # R2303

BC-1 bumper clip for 3/8" x 24 thread mounting. Aluminum construction. Fully adjustable, accepts PL-259 connector directly connected to mount.
ORDER # R2304

372+ magnetic mount for UHF connector-equipped mobile antennas. For use with antenna like Comet and Diamond that are equipped with a UHF screw on connection. 5" heavy duty magnetic mount, equipped with connector for direct installation of antenna onto the base.Comes equipped with 15 feet of RG58 coax and PL259 installed.
ORDER # R2305

T+ no hole trunk lip mount. To fit antennas like Comet and Diamond that are equipped with a UHF screw on connection. Uses two set screws under bottom of trunk lid to mount antenna on rear trunk lid. Comes equipped with 15 feet of RG58 coax and PL259 installed.
ORDER # R2306

T-NMO no hole trunk lip mount for NMO antennas. Same as T+ mount, but for mobile antennas that use an NMO connection between antenna and mount.
ORDER # R2308



375 Tri-Mag mount for 3/8 x 24 thread antennas. Over 400 pounds of holding power. No rust aluminum construction. Uses three circular magnetic pads on a 13" frame to securely hold mobile antennas in place. All stainless steel hardware, 15 feet of RG58 coax with PL259 connector installed is included. **ORDER # R2307**

F-NMO 2 screw NMO mount. Two self tapping screws hold mount to body of vehicle – mounted inside the edge of trunk of vehicle. Screws cannot be seen and can be easily removed if necessary without visible alteration to vehicle.
ORDER # R2310

NMO-1 magnetic mount for NMO antennas. Very strong 3" diameter powder coated magnet. 15 feet of RG58 coax with PL-259 attached included. Fits VHF/UHF antennas requiring NMO connection.
ORDER # R2311

235 Barrel spring for 3/8" x 24 thread antennas up to 9 feet in length. Equipped with removable stud.
ORDER # R2317

075 Ball mount and spring. Can be mounted in a variety of directions via split ball assembly. All hardware and instructions included.
ORDER # R2319

RC-1 rain cap for NMO mounts. Disconnected your NMO antenna from the mount? Keep the NMO mount connection protected from rain with a screw-on rain cap.
ORDER # R2318

009HD quick disconnect. for 3/8" x 24 thread antennas. Quickly remove a 3/8" x 24 thread antenna from its mount with a QD connector. Simply push down and turn and the antenna oxide plated brass.
ORDER # R2413

D-2 2 meter HT antenna. Economy priced replacement 'rubber duck' antenna for 2 meter handheld transceivers. BNC connector, 12" tall.
ORDER # R2500

D-27 144/440 MHz HT antenna. Economy priced replacement 'rubber duck' antenna for 2m/70cm handheld transceivers. BNC connector, 12" tall.
ORDER # R2501

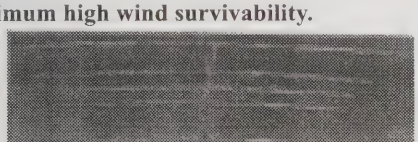
LDG ANTENNA TUNERS

AT-11MP The best design in desktop automatic antenna tuners. The LDG AT-11MP features a switched L-network design capable of handling 150 watts transmitter power. Quick, efficient operation, typical tuning time 3 seconds. Matches load impedances from 6 to 800 ohms (10:1 SWR). Dual cross needle metering allows simultaneous measurement of power output and SWR. SO-239 input and output connectors. Optional external balun allows tuning of random length, long wire, and other antenna systems. Measures HWD 2.5 x 9.5 x 8.25 inches, weight 3 pounds. Requires 13.8 VDC at 500 mA to operate.
ORDER # R4100

Z-11 QRP antenna tuner. The Z-11 QRP Autotuner is based on the AT-11 design with attention paid to reducing size and power consumption. Features a switched L-network design capable of handling up to 60 watts intermittent power use (30 watts continuous duty). Quick, efficient operation, typical tuning time 1.5 seconds. Matches load impedances from 6 to 800 ohms (10:1 SWR). Current consumption: 10 to 190 mA, 75 mA average. Zero current draw once tuned! Voltage requirement: 11 to 14 volts. SO-239 input and output connectors. Measures HWD 1.25 x 8.5 x 5 inches, weight 15 ounces.
ORDER # R4101

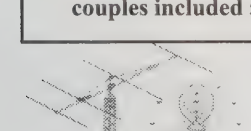
m^2 ANTENNAS

M2 Yagi antennas are the most ruggedly constructed, heavy duty Yagis available for amateur radio today. Superior performance makes these the #1 choice for monoband HF, VHF, and UHF antennas. Computer modeling and optimization assures the best possible performance from a given boom and element combination. All M2 antennas use machined aluminum element to boom mounts and feature stainless steel hardware through the antenna. All M2 antennas are ruggedized for maximum high wind survivability.



KT36XA. The result of hours spent perfecting the original classic KLM KT34XA through computer optimization and actual on-air tests. 5 of the 6 elements are resonant on each band (10, 15, and 20 meters). A dual driven element allows a beautiful flat match, broad gain, and front to back curves across all three bands.

DX includes: Hairpin type matching network couples included 5 kW balun to feedline.



10M4DX. 4 element 10 meter monoband Yagi.

12M4DX. 4 element 12 meter monoband Yagi.

15M4DX. 4 element 15 meter monoband Yagi.

17M3DX. 3 element 17 meter monoband Yagi.

17M5DX. 5 element 17 meter monoband Yagi.

20M4DX. 4 element 20 meter monoband Yagi.

Please contact us for availability and shipping time for M^2 products. Other M^2 products not listed here are available through Ten-Tec. Please contact us with your needs.

m^2 UHF ANTENNAS

6 meter HO LOOP. An omnidirectional horizontally polarized loop. Wide bandwidth makes it immune to all weather conditions except heavy ice. 800 watts power handling capability. The 6 meter HO loop is 29.5 inches square with a wind loading area of just 0.1 square foot. 3/8" diameter tubing construction keeps it light but plenty rugged for mobile operation. SO-239 antenna connector. Weighs only 2 pounds.
ORDER # R2100

6M3 3 element 50 MHz Yagi antenna. Rugged computer optimized Yagi offering low wind load and excellent performance. Quick and easy to assemble, also great for mountain topping or grid square expeditions.
ORDER # R2000

6M5X 5 element 50 MHz Yagi antenna. Latest computer optimized version of M2's earlier 6M5 design. For use at the low end of the band for SSB and CW operation, but tuning instructions are also included if 52-54 MHz operation for FM is preferred.
ORDER # R2001

6M7JHV 7 element 50 MHz Yagi antenna. Mid-sized 7 element Yagi. Excellent gain. M2's most popular 6 meter Yagi.
ORDER # R2002

2 meter HO LOOP. An omnidirectional horizontally polarized loop. Wide bandwidth makes it immune to all weather conditions except heavy ice. 800 watts power handling capability. The 2 meter HO loop is 11.25 inches square with a wind loading area of less than 0.1 square foot. 3/8" diameter tubing construction keeps it light but plenty rugged for mobile operation. SO-239 antenna connector. Weighs less than 1 pound.
ORDER # R2101

2M7 7 element 144 MHz Yagi antenna. Computer optimized to outperform longer old design antennas. 2M7 covers the whole band with only slight performance degradation at the band edges. Side lobes are low – perfect for stacking.
ORDER # R2003

2M12 12 element 144 MHz Yagi antenna. Featuring the latest in computer techniques for optimization of pattern and gain. Sturdy boom construction requires no support trusses to keep antenna in an even plane. Superior performance, long term electrical and mechanical integrity.
ORDER # R2004

2M5WL 17 element 144 MHz Yagi antenna. Designed with the serious VHF DXer in mind. Provides maximum gain for minimum weight and windload yet is strong enough to survive 100 mph winds. Widely used in EME and large Tropo scatter arrays, also a great choice for a single yagi 144 MHz application.
ORDER # R2005

MFJ 916. 2m/440 MHz duplexer. For use with dual band 2m/440 transceiver to connect to a single 2m/440 MHz antenna from a transceiver with separate antenna connections for each band. 50 ohm ports, 200 watts power rating.
ORDER # R2402

MFJ 815B SWR/power meter rated to 2000 watts. Large 3 inch cross-needle meter for simultaneous reading of forward power and SWR. Switchable power scales of 200 and 2000 watts. SO-239 connectors. Meter lamp requires 12 VDC.
ORDER # R9004

MFJ 564B Deluxe iambic paddles. Similar in style and construction to Bencher paddles. Tension/contact spacing adjustments, heavy base, non-skid feet. Black base.
ORDER # R9103

MFJ 434 "Contest" voice keyer. Microprocessor controlled. 5 memories for a total of 75 seconds of messaging. EEPROM used for memory storage, no backup batteries required. Can be remotely or computer controlled. Built-in speaker/amp formonitoring of stored messages. Can also be used to record receive audio off the air.
ORDER # R9105

MFJ 1910 Telescoping antenna support mast. Weighs just 3.3 pounds, collapses to 3.8 feet long. Pull out sections twist lock together, mast extends to 33 feet high! Put up wire antennas in portable locations in no time. Black, UV resistant super strong fiberglass construction.
ORDER # R3107

MFJ 295 HT speaker/mics. Small speaker/mics for handheld transceivers. Available for
ORDER # R9401 Icom (I)
ORDER # R9402 Kenwood (K)
ORDER # R9400 Yaesu (Y)
handheld VHF/UHF transceivers.

MFJ 259B SWR analyzer. The ultimate shack accessory? Reads SWR, complex RF impedance, coax cable loss, return loss, inductance, capacitance, etc. Side by side meters plus digital frequency readout. Extremely useful for antenna adjustments. SO-239 connector for direct connection of coax to 259B. Portable, battery powered. 1.8-170 MHz.
ORDER # R9500

MFJ 1315 Accessory power supply for MFJ 259B. Operate your MFJ 259B from 110 VAC.
ORDER # R9602

MFJ 105C 24 hour analog wall clock. 24 hour quartz movement 12 inch black face, white numerals. Gold colored hour, minute and second hands.
ORDER # R9510

MFJ 107B 24 hour UTC clock. Digital LCD readout. 5/8" high digits. Solid brushed aluminum frame, long life battery included.
ORDER # R9511

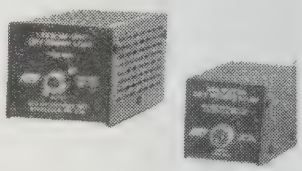
MFJ 108B dual LCD clocks with separate 24 and 12 hour displays. Read UTC and local time simultaneously. 5/8" digits. Mounted in brushed aluminum frame with sloped face for easy viewing. Long life battery included.
ORDER # R9512

MFJ 1116 DC power distribution panel. Connects to your 13.8 VDC power supply terminals to provide 6 connection points for various equipment. 15 amp total max. rating. Similar to MFJ 1112, but includes on/off power LED, power switch, and 0–25 VDC voltmeter.
ORDER # R9601

MFJ 1112 Bare-bones DC distribution panel. Connects to your 13.8 VDC power supply terminals to provide 6 connection points for various accessory equipment. 15 amp total max. rating.
ORDER # R9600

MFJ 260C 300 watt HF/VHF dummy load. Air cooled 50 ohm non-inductive dummy load. 300 watts for 30 seconds. Derating curve to 5 minutes. SWR 1:1 to 30 MHz, below 1.5:1 to 650 MHz. SO-239 antenna connector.
ORDER # R9610

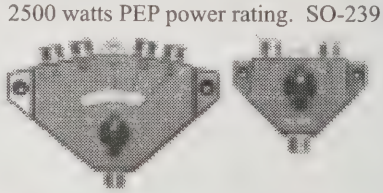
MFJ 264 1500 watt HF/VHF/UHF dry dummy load. Air cooled 50 ohm non-inductive dummy load. 100 watts for 10 minutes. 1500 watts for up to 10 seconds. SWR below 1.3:1 to 650 MHz. SO-239 antenna connector.
ORDER # R9611



MFJ 392 Headphones. For amateur radio and shortwave listening use. Padded headband and ear cushion design. Works in mono or stereo mode. 100-24000 Hz frequency response. 16 ohms impedance.
ORDER # R9620

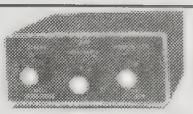
MFJ 281 ClearTone speaker. Designed to improve intelligibility of CW and SSB communications in the 600 to 4000 Hz range while reducing undesirable noise. Handles 8 watts, 8 ohm impedance.
ORDER # R9630

MFJ 1704 Four position coax switch. Center ground position. Replaceable lightning surge protector. 2500 watts PEP power rating. SO-239 connectors.
ORDER # R9206

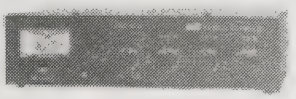


MFJ 1702C Two position coax switch. Center ground position. Unused terminal automatically grounded. Less than 0.2 dB insertion loss. SO-239 connectors.
ORDER # R9602

MFJ - ANTENNA TUNERS



MFJ 901B Basic "T" network antenna tuner. 200 watts PEP. 4:1 balun for balanced line built-in. SO-239 input and output connectors for coax fed antennas. Two variable capacitors, 12 step tapped inductor. No metering. HWD 2.5 x 5 x 6 inches.
ORDER # R4102

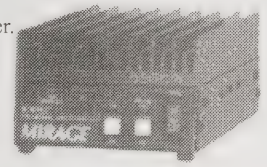


MFJ 941E Cross-needle metered "T" network antenna tuner. 300 watts PEP. 4:1 balun for balanced line built-in. SO-239 input and output connectors for coax fed antennas. Two variable capacitors, 12 step tapped inductor. Lighted cross-needle meter (requires 12 VDC) allows reading of SWR and forward power simultaneously. Antenna switching built-in. HWD 2.75 x 10.625 x 7 inches.
ORDER # R4103

MFJ 949E Deluxe 300 watt antenna tuner. Cross-needle metered "T" network antenna tuner. 300 watts PEP. 4:1 balun for balanced line built-in. SO-239 input and output connectors for coax fed antennas. Two variable capacitors, 12 step tapped inductor. Lighted cross-needle meter (requires 12 VDC) allows reading of SWR and forward power simultaneously. Antenna switching built-in. Built-in 300 watt dummy load. HWD 3.5 x 10.5 x 7 inches.
ORDER # R4104

MFJ 969 300 watt roller inductor antenna tuner. 1.8-50 MHz. Peak reading lighted cross-needle meter. 300 watts PEP. 4:1 balun for balanced line built-in. SO-239 input and output connectors for coax fed antennas. Two variable capacitors, air wound roller inductor. "T" network. Built-in 300 watt dummy load. Antenna switching built-in. HWD 3.5 x 9.5 x 10.5 inches.
ORDER # R4105

MIRAGE



A1015G 50 MHz linear amplifier. 10 watts input for 150 watts output. Ideal accessory for the Ten-Tec 526 VHF multi-mode transceiver.
ORDER # R4002

B1016G 144 MHz linear amplifier. 10 watts input for 160 watts output. Ideal accessory for the Ten-Tec 526 VHF multi-mode transceiver.
ORDER # R4003

B2518G 144 MHz linear amplifier. 25 watts input for 160 watts output. Ideal accessory for the Ten-Tec 526 VHF multi-mode transceiver.
ORDER # R4004

COMET VHF/UHF ANTENNAS

CA-ABC 22A 2m base antenna. Dual 5/8 wave design. 6.5 dB gain. 200 watts power rating. Aluminum construction. Total height 9.5 feet. SO-239 connector.
ORDER # R2102

GP-3 144/440 MHz base antenna. Fiberglass construction. 4.5/7.2 dB gain. 200 watts power rating. Total height 5' 11", weight 3 pounds. SO-239 connector.
ORDER # R2106

GP-6 144/440 MHz base antenna. Fiberglass construction. 6.5/9.0 dB gain. 200 watts power rating. Total height 10' 5", weight 4 pounds. SO-239 connector.
ORDER # R2107

GP-9 144/440 MHz base antenna. Fiberglass construction. 8.5/11.9 dB gain. 200 watts power rating. Total height 17' 8", weight 6 pounds. SO-239 connector.
ORDER # R2108

GP-15 50/144/440 MHz base antenna. Fiberglass construction. 3/6.2/8.6 dB gain. 200 watts power rating. Total height 7' 11", weight 3 pounds. SO-239 connector.
ORDER # R2109

B10-NMO NMO mount 144/440 MHz mobile antenna. Small, compact coil design. 12" high. 50 watts power rating. Unity gain. Black painted.
ORDER # R2207

B20-NMO NMO mount 144/440 MHz mobile antenna. Compact coil design. 30" high. 50 watts power rating. 2.15/5.0 dB gain. Black painted.
ORDER # R2208

SBB-5NMO NMO mount 144/440 MHz mobile antenna. 38" high. 120 watts power rating. 3.0/5.5 dB gain. Black painted
ORDER # R2209

SBB-7NMO NMO mount 144/440 MHz mobile antenna. 55" high. 70watts power rating. 4.5/7.0 dB gain. Black painted.
ORDER # R2210

BNC-24 144/440 MHz "Superflex" HT antenna. 17" high. Extremely thin taper wound antenna, highly flexible. Black. BNC connector for attachment to handheld transceivers.
ORDER # R2502

SBB25-NMO NMO mount 144 MHz mobile antenna. 4.1 dB gain. 100 watts power rating. Total height 52".
ORDER # R2202

MALDOL
VHF ANTENNAS

AS-20 144/440 MHz "Superflex" HT antenna. 8.5" high. Extremely thin taper wound antenna, highly flexible. SMA connector for attachment to handheld transceivers.
ORDER # R2503

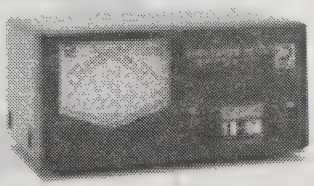
MH-209A same as MH-209, with SMA connector.
ORDER # R2506

MH-209 144/440 MHz. Very low profile small HT antenna, 3" high. Black. BNC connector for attachment to handheld transceivers.
ORDER # R2505

AS-30 144/440 MHz "Superflex" HT antenna. 15" high. Extremely thin taper wound antenna, highly flexible. SMA connector for attachment to handheld transceivers.
ORDER # R2504

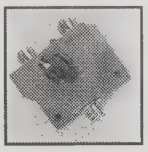
DAIWA
POWER/SWR METERS

CN101 HF/VHF 1500 watt peak reading power and SWR meter. 1.8-150 MHz, 1500 watts. Power output measured in three selectable scales of 15, 150, and 1500 watts. Cross-needle metering allows for simultaneous metering of power output and SWR. Selectable peak of average reading power.
ORDER # R9005

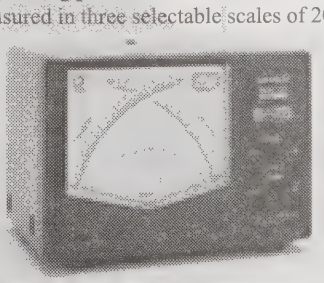


COAX SWITCHES

CS-201A 2 position coax switch. SO-239 style input and output connectors. 0-600 MHz. 1500 watts power rating.



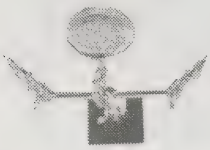
CN801H HF/VHF 2000 watt peak reading power and SWR meter. 1.8-200 MHz, 2000 watts. Power output measured in three selectable scales of 20, 200, and 2000 watts. Cross-needle metering allows for simultaneous metering of power output and SWR. Selectable peak of average reading power.
ORDER # R9006



PRECISION

Model 1133 Pencil solder iron with holder. 30 watt soldering pencil with small metal stand.
ORDER # R9300

Model 1134A Wire cutter, stripper, and crimping tool. 8" long. Stripping holes for 6 different sizes of insulated wire. Wire cutter. Crimping tool at tip.
ORDER # R9301



Model 3108 Soldering "helping hands" station. Acts as a "third hand" while soldering. Two 2" alligator clips and a magnifying glass on a heavy metal base to hold your soldering project steady.
ORDER # R9303

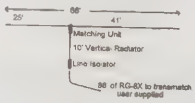
Model 3110 Soldering "helping hands" station. Like model 3108, but also includes a wire soldering iron holder attached to base.
ORDER # R9302

RADIO WORKS

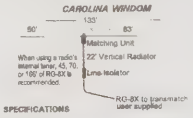
ANTENNAS AND ANTENNA ACCESSORIES

Carolina Windom 40, 80, and 160 models. The Carolina Windom's radiation pattern is different from simple dipoles and other similar antennas. Its unique combination of horizontal and vertical radiation components account for the performance the outclasses its competitors. The secret of the Carolina Windom antenna is its vertical radiator, which functions as both a matching stub and an active element of the antenna. A transmatch will be required for full coverage of all bands.

Carolina Windom 40. 10-40 meters. 66 foot antenna, fed off center with 25 feet of wire on one side of the feedpoint and 41 feet on the other. 10 foot vertical radiating section. Line isolation balun included. Requires 86' feet of 50 ohm coaxial cable as feedline.
ORDER # R1125



Carolina Windom 80. 10-80 meters. 133 foot antenna, fed off center with 83 feet of wire on one side of the feedpoint and 50 feet on the opposite side. 22 foot vertical radiating section. Line isolation balun included. Requires 50 ohm coaxial cable as feedline.
ORDER # R1126

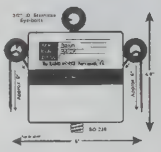


Carolina Windom 160. 10-160 meters. 265 foot antenna, fed off center with 182 feet of wire on one side of the feedpoint and 83 feet on the opposite side. 22 foot vertical radiating section. Line isolation balun included. Requires 70 or 166 feet of 50 ohm coaxial cable as feedline.
ORDER # R1127

B1-2K 1:1 current balun. 1500 watts power rating. Eye bolts on each side for connection of wire antenna to balun. Top eye bolt for connection of rope for center support. SO-239 style connector on bottom for direct connection of PL-259 equipped coax cable. Stainless steel hardware.
ORDER # R3001

B1-5K 1:1 current balun. 5000 watts power rating. Eye bolts on each side for connection of wire antenna to balun. Top eye bolt for connection of rope for center support. SO-239 style connector on bottom for direct connection of PL-259 equipped coax cable. Stainless steel hardware.
ORDER # R3002

B4-2KX 4:1 current balun. 1500+ watt power rating. Eye bolts on each side for connection of wire antenna to balun. Top eye bolt for connection of rope for center support. SO-239 style connector on bottom for direct connection of PL-259 equipped coax cable. Stainless steel hardware. Useful for off center fed dipoles, etc.
ORDER # R3003



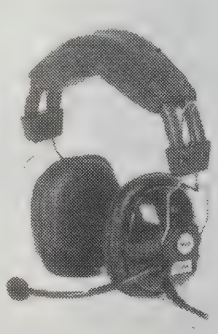
T-4 and T-4G line isolation baluns. Good for isolating ground loop problems. Used to isolate feedline from antenna and prevent coax shield from acting as a ground radial. 4000 watt power rating. T-4 and T-4G are identical, except T-4G also has a 6" strap connected to the ground side for easy connection of radials at the feedpoint of an antenna or to other needed ground connections.
ORDER # R3004 T-4
ORDER # R3005 T-4G

R9900 1/2 inch inner diameter snap-on chokes. Snap-on ferrite beads that can be added or removed as necessary to isolate RF problems in the shack. 1/2 inch inner diameter is large enough to be clamped over large coax like 9913 and RG213/U, or can be used for wrapping multiple turns of smaller wire through a single ferrite core.
ORDER # R9900

WGA HEADSETS AND ACCESSORIES

WGA has been selling high quality headset/boom microphone combinations for aircraft and amateur radio use for a number of years. WGA headset/boom mics come pre-wired with a 4 pin microphone connector attached for 'plug and play' connection to Ten-Tec transceivers. Can be user-modified for use with other transceivers. Made in USA.

TR-2000. The TR-2000 is a high quality headset/boom mike combo featuring an electret condenser noise-cancelling microphone. Spring loaded flexible boom on microphone attached to left earpiece. Padded top headphone rail. Over-the-ear headphone pieces to prevent ear pain from headphones squashing ears back against the head.
ORDER # R9621



PTT-2000 and FT-2000. As supplied, the TR-2000 has no built-in TR switching. It can be used 'as is' for VOX operation, but for PTT operation the use of a hand or foot switch must be employed. The PTT-2000 is a small hand-held PTT switch that plugs into a jack already wired onto the mic jack of the TR-2000. FT-2000 is a footswitch that can be connected to a PTT closure to ground on the back of your HF transceiver, or to the same jack on the mic plug of the TR-2000 that accepts the PTT-2000.
ORDER # R9622 PTT-2000
ORDER # R9623 FT-2000

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Sevierville, TN 37862, U.S.A.
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Repair Dept.: (865) 428-0364
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AF
TONE
FADE
BP
PBT
NOTCH
MIC
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PARAGON

Corsair II, Model 561

CORSAIR II, HF TRANSCEIVER, Model 561

The CORSAIR II is unique in all the world. This is the only full featured ham transceiver manufactured today that uses a permeability tuned oscillator. We continue to offer you this choice for a very good reason; a PTO delivers superior receiver performance. Strong adjacent signals are effectively rejected and the extremely low noise floor does not vary when strong adjacent signals are present. The ability of a PTO controlled receiver to dig out weak signals that are surrounded by "heavy hitters" is hard to beat.

Frequency tuning versatility is also unique. The main knob tunes at 18 kHz per revolution, without "incrementing." Two slower tuning rates are provided by the dual range offset control. The offset tuning is selectable to control the receiver or the transmitter, or in "transceive."

The pass band tuning in combination with 16 pole crystal ladder filtering provides enviable selectivity. Our 50 + dB notch filter virtually eliminates carrier type interference. An eight pole audio bandpass filter is also standard. Numerous features are included to delight the all-mode operator. The i-f filters are selectable independent of mode. QSK with a changeover time of 30 ms or less is great on CW and AMTOR. An electronic CW keyer with a 40 character memory is built in. A "spot" button makes it easy to "zero" a CW signal. Selectable AGC—fast, slow or off. SSB performance is enhanced with an excellent speech processor that is standard equipment as is a noise blanker with adjustable level and width controls.

All nine ham bands, from 1.8 to 30 MHz, are covered using a 12 position band switch. Each position provides 500 kHz plus 40 kHz overshoot at the band edges. Most of the MARS frequencies are included. WWV is received at 10 MHz.

The solid state, broadband "no tune" 200 watt input final amplifier (pioneered by Ten-Tec) is a solid performer, too. It will load a broader range of impedances and it does not "fold back" in key-down modes. De-rated components and excellent heat dissipation allow transmitter operation at full power, without auxiliary cooling for as much as 20 minutes, even in the "key-down" modes. The ALC control allows continuous adjustment of the output power level from 25% to 100%, independent of input drive levels. This is a great feature when driving a linear amplifier. Lower amplifier power levels may be used without re-adjusting or even connecting the amplifier derived ALC.

If your number one priority is outstanding all mode performance on the ham bands, and simplicity is still a virtue, you may be the kind of a purist who deserves a CORSAIR II.

RECEIVER SPECIFICATIONS

Sensitivity: 0.25 uV for 10 dB S/N ratio.
Selectivity: 16 pole crystal ladder filtering, 2.4 kHz bandwidth, 1.6:1 shape factor at 6/60 dB. Three position front panel switch selects standard 2.4 kHz, optional 1.8 kHz, 500 Hz or 250 Hz filters. All four may be installed with 2.4, 1.8 kHz and 500 Hz accessible in SSB mode and 1.8 kHz, 500 and 250 Hz accessible in CW mode.
Noise Floor: -129 dBm at 2.4 kHz bandwidth.
Intercept Point: +5 dBm.
Notch Filter: Greater than 50 dB notch adjustable from 200 Hz to 3.5 kHz.
Audio Bandpass Filter: 8 pole active filter centered at 750 Hz variable from "filtered" to "flat" response.
Passband Tuning (PBT): Tunes 2nd i-f frequency ± 1.5 kHz.
Noise Blanker: Switchable on/off with adjustable level and width.
Offset Tuning: Dual range, selectable to offset RX, TX or TRX.
Antenna RX Pre-Amp: Selectable on/off.
Spot Button: To accurately "zero" a CW signal.
AGC: Selectable fast, slow and off.
I-F Frequencies: 9 and 6.3 MHz.
I-F Rejection: Greater than 60 dB.
Dynamic Range: 95 dB typical at 200 Hz bandwidth.

TRANSMITTER SPECIFICATIONS

Power Output: Broadband, solid state "no tune" amplifier with 85 to 100 watts RF out on all bands. Full power TX for up to 20 minutes without auxiliary cooling.
Output Impedance: 50 ohm, unbalanced.
Iambic Keyer: Front panel speed adjustable from 8 to 50 wpm. Includes a 40 character memory, controlled from the KR1B accessory keyer.
Speech Processor: Audio type, processing level front panel adjustable.
CW Sidetone: Internally generated with adjustable tone and volume.
Full Break-In QSK: TX/RX changeover time of 30 ms or less.
ALC Control: Front panel adjustment sets RF output from 25% to 100%. Operates independently of input mic level, speech processing and CW drive. Output level remains constant until you change it.
Microphone: Low or high impedance, 5 mV output. Polarizing voltage for electrets available at mic connector.
SSB Generation: 9 MHz, 8 pole crystal ladder filter, balanced modulator. Carrier and unwanted sideband suppression, 60 dB typical.
CW Offset: 750 Hz, automatic.
Spurious Emission: Down 45 dB or better at full output.

GENERAL SPECIFICATIONS

Frequency Coverage: 160, 80/75, 40, 30, 20, 17, 15, 12 and 10 meters in twelve 500 kHz segments plus 40 kHz overshoot at upper and lower band edges.
Front Panel Multimeter: Reads power amplifier collector current, forward power, SWR, speech processing level and RX S-meter.
Front Panel Connections and Controls: BP FILTER; BPT; NOTCH; AF GAIN; POWER; RF GAIN/ATTN; DRIVE; bandswitch; main tuning knob; MODE; METER switch; KEYER SPEED; N.B. LEVEL/N.B. WIDTH; ALC threshold; PROCESS level; QSK/VOX select; AGC switch; XTAL switch; OFFSET SELECT switches (2); SPOT push-button; PHONES; MIC.
Rear Panel Connections and Controls: High speed QSK output jack (open collector); EXT T/R jack (relay closure); SPARE jack (uncommitted RCA phono); AUX 12 Vdc jacks (2); KEYER MEM. jack for controlling keyer memory; standard CW KEY jack; PTT jack; VFO IN/VFO OUT; AUDIO OUT; ACCESSORIES socket; GND terminal; EXT. SPKR jack; KEYER PADDLE jack; POWER socket; SO-239 ANTENNA connector; RX-TRX switch for separate RX antenna; RX antenna RCA jack; DELAY, GAIN, ANTI-VOX controls.
Power Required: 12 - 14 Vdc, 850 mA receive, 18.5 A transmit.
Frequency Display: 6 digit (to 100 Hz) amber LED.
Frequency Stability: Less than 15 Hz change per degree F averaged over a 40 degree change from 70 to 110 degrees F after 30 minute warm up. Less than 10 Hz change from 105 Vac to 125 Vac using a Ten-Tec power supply.
Dimensions: HWD 5.25" x 15" x 14" (13 x 38 x 36 cm) with bail.
Net Weight: 14 lbs. (6.4 kg).

Titan, Model 425

TITAN, HF LINEAR AMPLIFIER, Model 425

The Titan has it all! Maximum legal power with ease, all bands 160 through 15 meters (10 and 12 meters after authorized modification), lightning fast QSK for break-in CW and the digital modes and a two speed blower for quiet operation. This awesome performance from a desk top amplifier is made possible by the remote power supply and a pair of Eimac® 3CX800A7 ceramic triodes. The heart of the power supply is our own tape wound Hypersil® transformer . . . nearly noiseless, even at 1500 watts output!

Other features include a front panel, peak reading wattmeter using an instantaneous ten element LED bargraph display, HI-LO plate voltage select, built-in SWR meter and an "overdrive" warning LED. Vernier TUNE and LOAD controls in combination with an outstanding RF deck design, make the Titan a real "pussy cat" to load and operate.

The low drive requirement of the 3CX800A7 tubes (50 watts for 1000 watts output typical) makes life much nicer for your exciter too. Operating temperatures are substantially lower and component life is extended accordingly. This is especially comforting using the "keydown" modes.

There is some interesting reading about the Titan in two rather thorough "Product Review" articles. See QST, April 1986; CQ, February 1986. Both articles discuss the technical aspect of this amplifier as well as operational details.

The Titan is designed to match our Corsair II and Paragon but it pairs up nicely, no matter what exciter you are using. If you are ready to choose your dream amplifier, the Titan has it all! Check it out.

SPECIFICATIONS

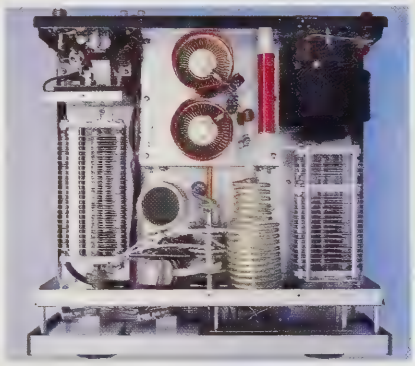
Frequency Coverage: 1.8 - 2.0, 3.2 - 4.7, 6.5 - 8.5, 13.4 - 19.6, 17.6 - 23.0. With 10 meter modification, 17.6 - 26.5, 20.6 - 31 MHz.
Drive Power: 65 to 80 watts typical for 1500 watts output.
Efficiency: 50 - 65% depending on frequency, drive level and load.
Distortion: -35 dB at 1 KW RF output level.
Harmonics: -50 dB typical.
Input and Output Impedance: 50 ohms.
CW Break-In: QSK with vacuum relay. RF sensing circuit prevents keying or un-keying if 10 mW of RF present on the RF drive line. Switching time less than 8 ms.
Tube Complement: Two Eimac® 3CX800A7 ceramic, external anode triodes in a grounded grid circuit. Plate dissipation, 1600 watts.
Plate Voltage: HI = 2400 Vdc, LO = 1800 Vdc, no load.
Cooling: Ducted forced air, vertical exhaust, using a two speed centrifugal blower.
Metering: Full time plate current. Switch selected plate voltage, grid current, forward power or reflected power. Peak power is indicated on a 10 element LED bargraph display. The first nine elements are amber—the tenth LED is red and indicates 1500 watts output.
ALC: Negative-going, adjustable threshold.
LED Status Indicators: Overdrive, Standby, Wait, Operate.
Primary Power: 220 - 250 Vac at 20 A, maximum. 117 Vac operation is possible but not recommended.
Protection: Primary line fuses, plate current fuse, ac line and high voltage interlocks.
Front Panel Controls: Power ON-OFF; Mode (STANDBY-OPERATE); plate voltage select (HI-LO); Plate TUNE; Loading; BAND Switch; METER Switch.

Size and Weight:
Amplifier: HWD 5.25″ x 15.25″ x 15″ (13.3 x 38.7 x 76.8 cm).
Power Supply: HWD 8.25″ x 13.4″ x 10.25″ (21 x 34 x 60 cm).
Amplifier: 17 lbs. (7.7 kg).
Power Supply: 45 lbs. (20.5 kg).

UPS shippable, factory packaged in three cartons; RF deck, power supply w/o power transformer, power transformer.

TITAN, HF LINEAR AMPLIFIER, Model 425E

Same as Model 425 except operation is enabled to 31 MHz. This model for export only.



...America's Best Kept Secret!

TEN-TEC

The ultimate in linear design and performance!

MADE IN USA

TEN-TEC Warranty and Product Support

In 1968 Ten-Tec was founded by Albert Kahn, K4FW, and Jack Burchfield, K4JU. From the beginning, product support and customer service have been basic. Our philosophy is that a sale is the beginning of a friendship and that it is our obligation to provide fast and economical service if ever needed. The application of the principal of the "Golden Rule" and caring for our customers has contributed greatly to our success.

Our term of warranty is one year. We promise you fast, thorough service, and if out of warranty, at a fair and honest cost. We strive to have all Ten-Tec owners happy ones.

Accessories for Paragon and Corsair II

REMOTE VFO, Model 263

This little beauty adds a whole lot of versatility to the CORSAIR II system. It uses the same type PTO as the CORSAIR II and can control transmit, receive or transceive frequency. You can also listen to both transmit and receive frequencies simultaneously! A balance control is provided for "priority" adjustment—a great feature in a DX pile-up! A momentary "reverse" button is provided to check your transmit frequency in any PTO configuration. Four crystal sockets are built-in and are front panel selectable; a nice touch if you are a net operator. Crystal controlled operation is possible on any of these bands: 160M 1.7 to 2.1 MHz, 80M 3.4 to 4.2 MHz, 40M 6.9 to 7.4 MHz, 30M 10.01 to 10.6 MHz, 20M 13.8 to 14.6 MHz, 17M 18.05 to 18.6 MHz, 15M 20.8 to 21.65 MHz, 12M 24.5 to 21.65 MHz, 10M 27.8 to 30.0 MHz.

The 263 connects directly to the CORSAIR II using the prefabricated cables provided.

Size: HWD 5.25″ x 7.5″ x 12″. (13.3 x 19 x 30.5 cm).
Weight: 4 lbs. (1.8 kg).

SPEAKER/POWER SUPPLY, Model 960

Designed for use with either the CORSAIR II or the PARAGON. This highly regulated and very well filtered power supply uses 109 to 125 or 218 to 250 Vac 50/60 Hz, primary power, fuse protected. The output voltage is adjustable from 11.5 to 15 Vdc, factory adjusted to 13.8 Vdc and "over-voltage" protection is incorporated. Regulation is better than 1%, from "no load" to "full load." A re-setting, electronic latching circuit breaker limits current for the protection of the radio and is adjustable. Maximum load is 25 A. Ripple is less than 60 mV peak-to-peak at 25 A, 117 Vac. The front panel mounted speaker is a ceramic magnet dynamic, 8 ohm. The output cable is terminated into a 4 pin AMP MATE-N-LOC® which connects to the CORSAIR II or PARAGON. Two rear panel phono jacks may be used to supply dc to low power accessories.

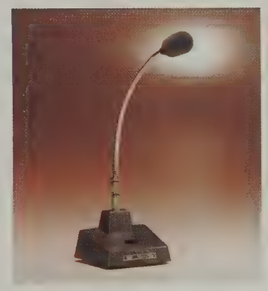
Size: HWD 5.25″ x 7.5″ x 13.5″. (13.3 x 19 x 34.3 cm).
Weight: 18 lbs. (8.2 kg).

DUAL PADDLE MEMORY KEY, CORSAIR II, Model KR1B/603

This lambic paddle is designed to operate the keyer system built into the CORSAIR II, including operation of the 40 character memory. Paddle "travel" is adjustable. Paddle "tension" is adjustable using a magnetic system controlled with a single rotary knob. Keyer is powered from an Auxiliary dc jack on the rear panel of the CORSAIR II.

MICROPHONES FOR 525 (D), 546, 580

700A Hand mic, electret w/coiled cord and phone plug
705A Desk mic, electret with cord and phone plug



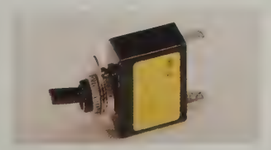
MICROPHONES FOR 560, 561, 585

700 C Hand mic, electret w/coiled cord and connector
705 Desk mic, electret with cord and connector

HF ACCESSORY FILTERS

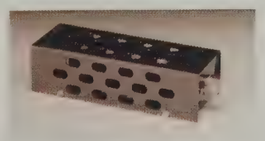
For 560, 561, 580, 585 Transceivers
282 250 Hz 6 pole ladder filter
285 500 Hz 6 pole ladder filter
288 1.8 KHz 8 pole ladder filter

For 546/525(D)
217 500 Hz 8 pole ladder filter
218 1.8 kHz 8 pole ladder filter
219 250 Hz 6 pole ladder filter
220 2.4 kHz 8 pole ladder filter



CIRCUIT BREAKER

1140 DC Models 546/560/561/580/585



DUMMY LOAD

209 1.8 to 30. MHz, 300 watts

NEW! Paragon, Model 585

PARAGON HF TRANSCEIVER, Model 585

Meet America's newest full featured, synthesized transceiver. General coverage all mode receiver tunes from 100 kHz to 29.999.99 MHz. Transmit at 100 watts output on all authorized frequencies from 1.8 to 29.999.99 MHz. SSB, CW, FSK and optional FM. Noise blanker and speech processor are standard equipment. Dual VFOs, RX offset, TX offset, QSK with a changeover time of less than 30 ms, five i-f filters (standard 6 kHz AM and 2.4 kHz SSB, optional 1.8 kHz, 500 Hz and 250 Hz) that are front panel selectable independent of mode, selectable tuning rates with automatic speed-up at rapid tuning knob rotation, passband tuning, audio bandpass filtering, tone control, squelch, notch filtering and more!

Sixty-two programmable memories that include frequency, mode, filter selected, channel number and a 7 digit alpha-numeric tag for entering a net name, call sign or I.D. of your choice. As the memory channels are scanned, all of the information is displayed (what a light show!) and the receiver automatically sets up mode, filters, tag and frequency as stored in each channel. Channels scanned are totally controllable with global lock-out, global reset and individual lock-out and reset.

The construction is impressive too. All circuit boards are glass epoxy (G-10) and all of them can be removed without desoldering. The front panel is hinged to provide access to all sections of the chassis. All aluminum construction keeps the weight of the rig reasonable too. And of course, the front panel is a spacious arrangement which makes the critical controls easy to use.

Frequency selection can be made using the main tuning knob, keypad direct entry or up/down buttons that can shift one MHz or to the next ham band. Frequency readout is selectable to display to 100 Hz or 10 Hz. Front panel clock is programmable for 12 or 24 hour format. Rear panel input and output provisions keep the all-mode operator in mind too. Fixed level audio out and FSK keying (170 Hz shift), auxiliary dc jacks for low power station accessories, amplifier control circuits plus all the other connections that you could possibly need, including RS-232 computer interface options.

The Paragon is the end result of a three year engineering effort. Much of that effort was invested in improving the receiver performance and controlling the phase noise inherent in a PLL oscillator. We are proud of the performance of the Paragon and we think it has set new standards of excellence in synthesized rigs. All we ask is that you take the time to check it out. We think that you will share our pride in the Paragon.

GENERAL SPECIFICATIONS

Frequency Range: Receive: 100 kHz to 29.9999 MHz. Transmit: 1.6 to 29.9999 MHz.
Frequency Control and Readout: Microprocessor controlled digital PLL synthesizer. 10 Hz resolution.
Frequency Stability: Worst case, 1 PPM per degree C. at 29.999 MHz.
Frequency Accuracy: ± 100 Hz @ 25 degrees C.
Tuning Rate:

	Normal	Normal Shifted
CW/USB/LSB/FSK	10 Hz 4.8 kHz per turn	20 Hz 9.6 kHz per turn
AM/FM	50 Hz 24 kHz per turn	100 Hz 48 kHz per turn
	Fast	**Fast Shifted**
CW/USB/LSB/FSK	20 Hz 9.6 kHz per turn	50 Hz 24 kHz per turn
AM/FM	100 Hz 49 kHz per turn	500 Hz 240 kHz per turn

Antenna Impedance: 50 ohm unbalanced.
PC Boards: 14 double-sided, 9 single-sided .062″ glass-epoxy.
Power Required: Receive = 1.5A. Transmit = 20A. 12 - 14 VDC.
Dimensions: HWD 5¾″ x x 17″. 14.6 x 27.3 x 43.2 cm.
Net Weight: 16 lbs. 7.25 kg.

TRANSMITTER

Modes: USB & LSB (J3E), CW (A1A), FSK (F1A); FM (F3E) optional (Model 256).
DC Power Input: Maximum 200 watts.
RF Power Output: ALC stabilized, adjustable, 10 to 100 watts (into 50 ohms) with front panel RF OUT control.
Microphone Input: Low impedance, bias voltage for electret provided.
CW Sidetone: Internally generated, adjustable tone and volume independent of AF GAIN control.
SSB Generation: 9 MHz, 8-pole crystal ladder filter. Balanced modulator.
Carrier Suppression: Greater than 60 dB.
Unwanted Sideband Suppression: Greater than 60 dB at 1.5 kHz AF input.
Harmonic Emissions: Greater than 45 dB below peak power output.
Spurious Output: Greater than 50 dB below peak power output.
Third Order Intermod Products: -30 dB from two-tone at 100 watts PEP.
Metering: Switchable forward power, SWR, collector current or audio processing level on SSB.
CW Offset: 750 Hz automatic.
FSK Shift: 170 Hz.
Transmit Offset Tuning Range: ± 99.9 kHz.

RECEIVER

Modes: USB, LSB, CW, FSK, AM, (FM optional).
Sensitivity:

	.1 - 1.6 MHz	1.6 - 29.999 MHz	
SSB/CW/RTTY	.5 uV	.15 uV	10 db S/N@ 2.4 kHz
AM	3.5 uV	1.0 uV	10 dB S/N @ 6.0 kHz
FM	1.0 uV	.3 uV	12 dB SINAD @ 15 kHz

Selectivity:

	-6 dB BW	-60 dB BW	Shape Factor
Standard AM	6.0 kHz	11.25 kHz	1.875:1
Standard SSB	2.4 kHz	3.36 kHz	1.87:1
Opt. 1.8 kHz SSB (Model 288)	1.8 kHz	2.9 kHz	1.60:1
Opt. 500 Hz CW (Model 285)	500 Hz	1.4 kHz	2.80:1
Opt. 250 Hz CW (Model 282)	250 Hz	.85 kHz	3.40:1
Standard FM	15 kHz	30 kHz	2.00:1

Attenuator: -20 dB for 1.6 to 29.999 MHz, -10 dB for .1 to 1.6 MHz.
I-F Frequencies: 1st = 75 MHz, 2nd = 9.0 MHz, 3rd = 6.3 MHz (FM 3rd = 455 kHz).
Image Rejection: Greater than 80 dB.
I-F Rejection: Greater than 70 dB.
Noise Blanker: Switchable on/off with adjustable width.
Dynamic Range: 100 dB.
Blocking Dynamic Range: + 16 dBm for 1 dB compression of an S9 signal, frequency offset = 50 kHz. -2 dBm for 1 dB compression of an S3 signal, frequency offset = 50 kHz.
Third Order Intercept: + 18 dBm.
Noise Floor: -132 dBm @ 2.4 kHz BW.
Squelch Sensitivity: Less than .6 uV.
Receiver Recovery Time: Less than 27 ms.
Receiver Offset Tuning Range: ± 99.9 kHz.
Pass Band Tuning I-F Shift: ± 1.2 kHz.
Audio Output: 1.5 watts @ 8 ohms.
Notch Filter: 250 to 2.2 kHz, greater than 50 dB notch depth.
Audio Bandpass Filter: 4 pole, variable center frequency 220 to 1.7 kHz, 35% bandwidth @ -6 dB.
Tone Control: Variable 15 dB rolloff @ 5 kHz.

For the serious radio operator!

Titan, Model 425

TITAN, HF LINEAR AMPLIFIER, Model 425

The Titan has it all! Maximum legal power with ease, all bands 160 through 15 meters (10 and 12 meters after authorized modification), lightning fast QSK for break-in CW and the digital modes and a two speed blower for quiet operation. This awesome performance from a desk top amplifier is made possible by the remote power supply and a pair of Eimac® 3CX800A7 ceramic triodes. The heart of the power supply is our own tape wound Hypersil® transformer . . . nearly noiseless, even at 1500 watts output!

Other features include a front panel, peak reading wattmeter using an instantaneous ten element LED bargraph display, HI-LO plate voltage select, built-in SWR meter and an "overdrive" warning LED. Vernier TUNE and LOAD controls in combination with an outstanding RF deck design, make the Titan a real "pussy cat" to load and operate.

The low drive requirement of the 3CX800A7 tubes (50 watts for 1000 watts output typical) makes life much nicer for your exciter too. Operating temperatures are substantially lower and component life is extended accordingly. This is especially comforting using the "keydown" modes.

There is some interesting reading about the Titan in two rather thorough "Product Review" articles. See QST, April 1986; CQ, February 1986. Both articles discuss the technical aspect of this amplifier as well as operational details.

The Titan is designed to match our Corsair II and Paragon but it pairs up nicely, no matter what exciter you are using. If you are ready to choose your dream amplifier, the Titan has it all! Check it out.

SPECIFICATIONS

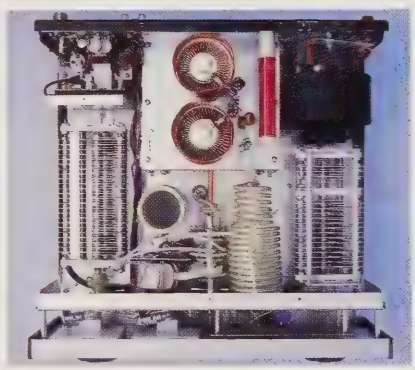
Frequency Coverage: 1.8 - 2.0, 3.2 - 4.7, 6.5 - 8.5, 13.4 - 19.6, 17.6 - 23.0. With 10 meter modification, 17.6 - 26.5, 20.6 - 31 MHz.
Drive Power: 65 to 80 watts typical for 1500 watts output.
Efficiency: 50 - 65% depending on frequency, drive level and load.
Distortion: -35 dB at 1 KW RF output level.
Harmonics: -50 dB typical.
Input and Output Impedance: 50 ohms.
CW Break-In: QSK with vacuum relay. RF sensing circuit prevents keying or un-keying if 10 mW of RF present on the RF drive line. Switching time less than 8 ms.
Tube Complement: Two Eimac® 3CX800A7 ceramic, external anode triodes in a grounded grid circuit. Plate dissipation, 1600 watts.
Plate Voltage: HI = 2400 Vdc, LO = 1800 Vdc, no load.
Cooling: Ducted forced air, vertical exhaust, using a two speed centrifugal blower.
Metering: Full time plate current. Switch selected plate voltage, grid current, forward power or reflected power. Peak power is indicated on a 10 element LED bargraph display. The first nine elements are amber—the tenth LED is red and indicates 1500 watts output.
ALC: Negative-going, adjustable threshold.
LED Status Indicators: Overdrive, Standby, Wait, Operate.
Primary Power: 220 - 250 Vac at 20 A, maximum. 117 Vac operation is possible but not recommended.
Protection: Primary line fuses, plate current fuse, ac line and high voltage interlocks.
Front Panel Controls: Power ON-OFF; Mode (STANDBY-OPERATE); plate voltage select (HI-LO); Plate TUNE; Loading; BAND Switch; METER Switch.

Size and Weight:
Amplifier: HWD 5.25″ x 15.25″ x 15″ (13.3 x 38.7 x 76.8 cm).
Power Supply: HWD 8.25″ x 13.4″ x 10.25″ (21 x 34 x 60 cm).
Amplifier: 17 lbs. (7.7 kg).
Power Supply: 45 lbs. (20.5 kg).

UPS shippable, factory packaged in three cartons; RF deck, power supply w/o power transformer, power transformer.

TITAN, HF LINEAR AMPLIFIER, Model 425E

Same as Model 425 except operation is enabled to 31 MHz. This model for export only.



...America's Best Kept Secret!

TEN-TEC

The ultimate in linear design and performance!

MADE IN USA

Argosy II, Model 525D

ARGOSY II, HF TRANSCEIVER, Model 525D

An admirable combination of small size, simplicity and low cost, the ARGOSY II has top quality "basics" usually found only in the most expensive rigs. PTO frequency control, a 100 watt input, no tune solid state final with an enviable history of reliability, rugged construction that survives the rigors of portable and mobile use, excellent SSB performance and Ten-Tec QSK CW, of course.

Operates 80, 40, 30, 20, 15 and 10 meters in 500 kHz segments with 40 kHz overshoot at segment edges. Primary power is 12 to 14 Vdc, 500 mA RX, 9 A TX. Front panel switch selects Hi (50 watts)/Lo (5 watts) RF power. Optional RX filters, 1.8 kHz, 500 Hz or 250 Hz. Receiver offset tuning range is 6 kHz and the variable notch filter has better than 50 dB rejection.

The clutter-free front panel is especially appreciated by the mobile operator. After just a few hours of operation, you can control the rig without even looking at it, even with fat fingers!

GENERAL SPECIFICATIONS

Frequency Coverage: 3.5 - 4.0, 7.0 - 7.5, 10.0 - 10.5, 14.0 - 14.5, 21.0 - 21.5, 28.0 - 30.0 MHz with approximately 40 kHz overshoot at band edges.
Operating Modes: LSB, USB and CW.
Frequency Stability: Less than 20 Hz change per degree F averaged from 70 to 110 degrees F, after 30 minute warm-up.
Tuning: Vernier drive, 18 kHz per turn.
Frequency Display: Four digit, 0.3" LED numerals display kHz and 100 Hz. Accuracy is ± 100 Hz. Bandswitch displays MHz.
Power Requirements: 12 - 14 Vdc regulated to 5% or better, 500 mA RX, 9 A maximum TX (can plug into cigar lighter, mobile). Front panel on/off switch controls ac power supply or accessory circuit breaker for dc operation.
Panel Meter: RX S-meter, reads forward power and SWR in TX.
Semiconductors: 48 Transistors, 4 FETs, 18 ICs, 52 diodes, 4 PIN diodes, 2 LEDs.
Dimensions: HWD 4" x 9.5" x 12" with bail retracted. (10.2 x 24 x 30.5 cm).
Weight: 8 lbs. (3.6 kg).

RECEIVER SPECIFICATIONS

Sensitivity: 0.3 uV for 10 dB S + N/N, typical.
Selectivity: 4 pole crystal filter. 2.5 kHz bandwidth, 2.7:1 shape factor @ 6/50 dB.
Audio Output: 1 watt at 8 ohms, less than 2% distortion.
I-F Frequency: 9 MHz.
I-F Rejection: 60 dB.
Notch Filter: Greater than 50 dB notch rejection, tuneable from 200 Hz to 3.5 kHz.
Audio CW Filter: Center frequency 750 Hz. Switch position 1 has 450 Hz bandwidth down 10 dB at 400 Hz and 1500 Hz. Position 2 has 150 Hz bandwidth, down 40 dB at 400 Hz and 1500 Hz.
Spurious Response: -50 dB nominal.
Offset Tuning: ± 3 kHz, center detent off.

TRANSMITTER SPECIFICATIONS

RF Power Output: 40 - 50 watts, 4 - 5 watts in low power mode.
T/R Switching: PIN diode antenna switch, push-to-talk on SSB, full break-in QSK on CW.
CW Sidetone: Internally generated, level and tone adjustable independent of RX audio level.
SSB Generation: 9 MHz 4 pole crystal ladder filter. Converts to 8 pole with optional Model 220 filter. Balanced modulator.
Microphone: High impedence crystal, ceramic, or dynamic.
Carrier Suppression: 40 dB minimum.
Unwanted Sideband Suppression: 30 dB minimum at 1 kHz tone.
Spurious Emission: -45 dB or better.
ALC: Front panel adjustable with LED indicator.
Front Panel Controls: AF GAIN/POWER on/off; DRIVE; NOTCH; OFFSET tuning; BAND select; main tuning knob; MODE select; NOISE BLANKER on/off; RF power FWD/REV; DISPLAY on/off; XTAL FILTER in/out; 2 position AF FILTER switch; MIC jack; HEADPHONE jack.
Rear Panel Controls and Connections: HIGH/LOW RF POWER switch; SO-239 ANTENNA connector; KEY jack, dc POWER input; GND post; 2 AUXILIARY dc OUTPUT jacks for low power accessories.

POWER SUPPLY, ARGOSY II, Model 225

Compact, yet heavy duty. Primary power 105 - 125 Vac, or 210 - 250 Vac. Output 13.5 Vdc at 10 A. Remote on/off from front panel switch on Argosy II. Electronic latching circuit breaker for over-current protection. "Crow-bar" circuit provides over-voltage protection. Voltage regulation better than 1%, no load to full load @ 117 Vac. Loves to travel or will stay at home and work all day, every day.
Size: HWD 3.5" x 4" x 10.5". (8.9 x 10.2 x 26.7 cm).
Weight: 9 lbs. (4 kg).

MOBILE MOUNT, ARGOSY II, Model 222

Tray attaches to bottom of Argosy II using fittings supplied. Spring loaded quick release allows removal of the radio with a flip of the locking lever. Mounting bracket can be used for top or bottom mount.

NOISE BLANKER, ARGOSY II, Model 223 and 223A

Effectively blanks pulse noise typical from ignition systems. Mounts internally and is turned on/off from front panel switch. Model 223 for serial numbers below 0824. Model 223A for serial numbers above 0823.

DC CIRCUIT BREAKER, ARGOSY II, Model 1125

Current protection (10 A) for mobile operation and for base operation with any power supply other than the Ten-Tec Model 225. Remote switching with front panel on/off switch included.

AMPLIFIER SWITCHING KIT, Model 1126

Required when using an external linear amplifier with the Argosy II. Easily installed internally. Provides T/R keying to amplifier and includes adjustable "hang time."

Century/22, Model 579

CENTURY/22, CW TRANSCEIVER, Model 579

This little honey puts the fun back into hamming. Whether you are a beginner or a seasoned veteran looking for a new challenge, you will have a ball with this first class CW rig. Its small size and weight make the CENTURY/22 great for portable or mobile use and the excellent performance makes it a good choice for base station QRP operation. It also receives USB and LSB.

All solid state of course, including a broad band "no tune" 50 watt input final amplifier. Operates on 80, 40, 30, 20, 15 and the bottom 500 kHz of 10 meters, in 500 kHz band segments plus 40 kHz overshoot at the segment edges. Full break-in CW, variable bandpass audio filter and offset tuning, add the versatility that you would expect only in a much more expensive rig. Who says ham radio has to be expensive?

SPECIFICATIONS

Frequency Coverage: 3.5 to 4.0, 7.0 to 7.5, 10.0 to 10.5, 14.0 to 14.5, 21.0 to 21.5, 28.0 to 28.5, plus approximately 40 kHz overshoot at segment edges.
Stability: Less than 20 Hz change per degree Fahrenheit from 70 to 110 degrees after 30 minute warm-up.
Tuning Rate: Approximately 18 kHz per turn.
Power Requirement: 12 to 14 Vdc. At 13.5 Vdc, 500 mA RX, 5 A maximum TX.
Frequency Read-Out Accuracy: ±5 kHz, ±2 kHz using optional crystal calibrator.
Output Impedance: 50 - 75 ohms, unbalanced.
Receiver Sensitivity: .05 uV for 10 dB S + N/N, typical.
Receiver Selectivity: 8 pole variable band-pass audio filter centered at 750 Hz. 200 Hz bandwidth, variable skirt attenuation.
Receive Offset: Adjustable ± 2 kHz, zero at center detent.
Audio Output: 1 watt, 8 ohms, less than 2% distortion.
Transmitter Power: 50 watts input, nominal 20 watts output with SWR 2:1 or less, ALC limited.
Semiconductors: 28 transistors, 24 diodes, 7 ICs.
Front Panel: Receiver RF gain; AF power; OFFSET tuning; AUDIO FILTER adjust; Main tuning knob; BAND switch; transmitter DRIVE adjust; FWD/REF power meter switch; XTAL calibrator ON/OFF switch; TUNE lock switch; PHONE jack; KEY jack; ALC LED and multi-meter.
Rear Panel: SO-239 ANTENNA connector; dc POWER socket; KEY jack; 2 Auxiliary 12 Vdc output jacks; 7.5 A FUSE and GND post.
Dimensions: HWD 4" x 10" x 10.5" (10.2 x 25.4 x 26.7 cm).
Weight: 6 lbs. (2.7 kg).

CRYSTAL CALIBRATOR, CENTURY/22, Model 226

Installs internally with plug-in inter-connections. Provides a marker signal every 25 kHz. Marker signal is pulsed at 4 times per second to ensure easy recognition. Calibration is with the main tuning knob skirt.

ELECTRONIC KEYER BOARD, CENTURY/22, Model 679

A discrete circuit board that installs internally. Keys with any keyer paddle. Rear panel control allows continuous speed adjustment from 6 to 50 wpm.

DC CIRCUIT BREAKER, CENTURY/22, Model 1179

For mobile use or when any power supply other than a Ten-Tec Model 979 or 979E is used. Provides on/off switching from front panel switch and over-current protection (trips at 6.75 A) for the rf amplifier.

Enjoy CW at its best with the Century/22

...America's Best Kept Secret!

TEN-TEC

Power Supply

POWER SUPPLY, CENTURY/22, Model 979

A highly regulated, continuous duty, 5 A 13.5 Vdc supply. Primary power 105/125 Vac, 50/60 Hz. Over-current protected with an electronic latching circuit breaker. Output connectors, one AMP MATE-N-LOCK® 4 pin and one Auxiliary RCA phono jack for low current accessories.
Size: HWD 3.25" x 4.25" x 10" (9.5 x 11 x 25.4 cm).
Weight: 6 lbs. 4 oz. (2.8 kg).

POWER SUPPLY, CENTURY/22, Model 979E

Same as Model 979 except primary power is 210/250 Vac, 50/60 Hz.

MADE IN USA

KW Antenna Tuner, Model 229B

KW ANTENNA TUNER, Model 229B

This tuner adds a lot of versatility to your station. For example, it solves the problem of operating an 80 meter dipole on 75 meters and still presenting your transmitter with an acceptable load impedance. Or if you want to explore the WARC bands and you haven't gotten around to installing resonant antennas for those bands, no problem. The 229B will load virtually any unbalanced load (coaxial or single wire) and do so at all the power the law allows from 1.8 through 30 MHz. The modified "L" network will tame an SWR of at least 10:1, any phase angle, without "false load" problems.

With the accessory balun, (installs easily inside the 229B cabinet) the same capability is available using balanced feedline antennas. Front panel switching selects any one of four antennas, one of which may use a balanced feedline, or you can by-pass the tuner. The meter circuit measures forward power in 2 ranges, 0-200 or 0-2 KW, and reflected power. A great way to operate all bands with something less than a "world class" antenna farm.

SPECIFICATIONS

Circuit: Modified "L" network.
RF Power: 2 KW.
Frequency Range: 1.8 to 30 MHz.
Output Matching Range: At least 10:1 SWR, any phase angle, 1.8 to 30 MHz. Maximum impedance at full power, 3000 ohms. Maximum impedance, balanced load using accessory balun, 500 ohms.

Input Impedance: 50 ohms, SO-239 connector.
Capacitor Voltage Rating: 3.5 kV.
Inductance: 28 uH silver plated roller inductor.
Size: HWD 5.5″ x 13″ x 11″ (13.9 x 33 x 27.9 cm).
Weight: 9 lbs. (4.1 kg).

ROLLER INDUCTOR and high power variable capacitor, used in the 229B are available separately. Contact our Service Department for details.

BALUN ACCESSORY for 229B Model 3229

Get superb performance from your equipment with the KW antenna tuner!

The Ultimate, HF Mobile Antenna System

HF mobile operation is a world of compromise. Give yourself a break and start with a good antenna system. The ULTIMATE series provides the best compromise between radiation efficiency and mechanical "reality!" The lower section is a fiberglass enclosed loading coil. The upper "stinger" is a top quality, stainless steel, taper ground whip. It is vertically adjustable for "no tears" tuning. The overall height allows use without a spring and clears most overhead obstacles. The overall profile provides the lowest wind resistance and as a result, less tilting and de-tuning. The entire assembly is environmentally protected for years of trouble free service. Use any mount with ⅜″ x 24 fitting.

MODEL 3110, 10 Meter Antenna, 72″

MODEL 3115, 15 Meter Antenna, 72″

MODEL 3120, 20 Meter Antenna, 72″

MODEL 3130, 30 Meter Antenna, 72″

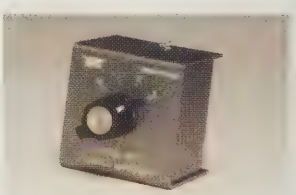
MODEL 3140, 40 Meter Antenna, 78″

MODEL 3175, 75 Meter Antenna, 78″

MODEL 3180, 80 Meter Antenna, 78″

MODEL 3101, Replacement Stinger 42″

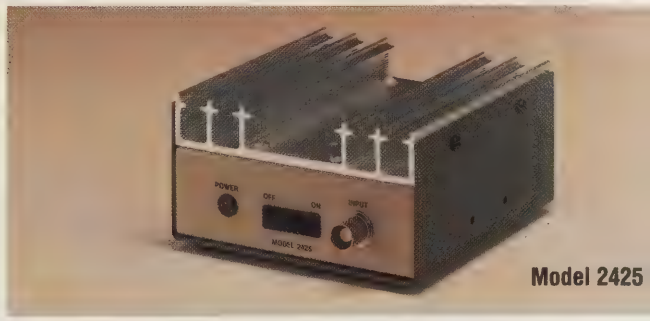
MODEL 3001, 20 - 80 Mobile Matcher



MODEL 3001

Mode B, Satellite Station Model 2510

Model 2410



Model 2425

SATELLITE STATION, MODE B, Model 2510

If you have a heavy duty investment in a good HF station, the 2510 makes good sense. The 2510 is a 10 watt, all mode, 70 cm transmitter with an excellent 2 meter receiver/converter. The receiver output is converted to 29 MHz. As with any amateur radio pursuit, the key to success is receive capability and with the 2510 you use all of the excellent filtering and selectivity that you already have in your HF receiver.

Frequency tuning is accomplished with the VFO in the 2510. The transmitter frequency tracks the receiver tuning so that pseudo transceive operation is possible. Provisions are also made for "split" operation for optimum flexibility. Superb performance and compact size make the 2510 a great choice for the operator who also works the HF bands.

TRANSMITTER

Frequency Range: 435.0 to 435.5, extendable to 437.0 MHz with optional oscillator assembly.
Output Power: Adjustable to 10 watts maximum.
Output Impedance: 50 ohms, unbalanced.
Modes: USB, LSB, CW. AFSK derived digital modes.
Sideband Generation: Balanced modulator through 4 pole monolithic filter.
Transmitter Switching: PTT through mic connector.
Carrier Suppression: 50 dB minimum.
Unwanted Sideband Suppression: 30 dB minimum at 1 kHz.
Spurious and Harmonic Output: Better than 50 dB below full power rating.
Microphone Input: Low or high impedance with 5 mV output. Polarizing voltage for electret mic available at connector.

RECEIVER

Frequency Range: 145.5 to 146.0 MHz. Converted to 29 MHz output.
Conversion Gain: 25 dB typical.
Image Rejection: Greater than 60 dB.
Noise Figure: Less than 2.5 dB. GaAsFet conversion.
Dynamic Range: 85 dB typical.

GENERAL

Power Requirement: 12 to 14 Vdc, 3 A maximum.
Size: HWD 4.5" x 7.6" x 11" (11.4 x 19 x 27.9 cm).
Weight: 6 lbs. (2.7 kg).

Linear Amplifier, 70 cm

LINEAR AMPLIFIER, 70 cm, ALL MODE, Model 2410

With type "N" connectors, Model 2410N

The 2410 is a 10 dB gain solid state, no-tune amplifier for operation from 430 to 450 MHz. 100 watts output with 10 watts drive. TX/STDBY switching can be controlled remotely with hard switching or will key automatically when 300 mW RF is sensed at the input circuit. The stripline design uses a high quality Teflon® circuit board and de-rated components throughout. Primary power is 12 to 14 Vdc at 20 A. Ideal for mobile, portable or base station use. A perfect companion for the 2510 Satellite station.

SPECIFICATIONS

Frequency Range: 430 to 450 MHz.
Output Power: 100 watts output with 10 watts drive.
Input Power: 15 watts maximum. RF sensing circuit keys amplifier at 300 mW.
Modes: SSB, CW, FM, RTTY.
DC Power: 12 to 14 Vdc at 20 A, typical.
Input/Output Impedance: 50 ohms, unbalanced.
Duty Cycle: Intermittent, typical amateur service.
Protection: Reverse voltage; over temperature kicks out at 170 degrees F, resets at 140 degrees F; internal 35 A fuse in dc line.
Delay: T/R delay adjustable in SSB mode.
RF Connectors: Model 2410, SO-239. Model 2410N, type "N".
Size: HWD 3.25" x 5.7" x 11.25" (8.3 x 15 x 29 cm).
Weight: 4 lbs., 14 oz. (2.2 kg).

2 Meter Amplifier, Model 2425

2 METER AMPLIFIER, 30 WATT, Model 2425

The model 2425 is a high quality, compact amplifier designed to be used with a hand-held transceiver. One to three watts of drive is amplified to thirty watts output. The amplifier is carrier operated and is ideally suited for mobile, portable or base station use.

SPECIFICATIONS

Frequency Range: 144 to 148 MHz.
Mode: Class C, FM or CW.
Input Power: 1 to 3 watts.
Output Power: 25 to 30 watts.
Harmonic Output: More than 60 dB below carrier.
Primary Power: 12 to 14 Vdc. 13.8 Vdc (negative ground) 5 A.
Impedance: 50 ohms input and output, unbalanced.
Switching: Carrier operated relay.
Size: HWD 2.25" x 4.12" x 5" (5.7 x 10.5 x 12.7 cm).
Weight: 1 lb. (.45 kg).

...America's Best Kept Secret!

TEN-TEC

MADE IN USA

The Ten-Tec Story

All Ten-Tec products are produced in our 40,000 square foot plant located in the foothills of the Great Smoky Mountains. The basic processes are done in-house including the design and manufacture of printed circuit boards, plastic molding, sheet metal fabrication and finishing, and of course electronic assembly and testing. We produce our own tooling in our well equipped tool and die shop. Our development lab and quality control department are exceptionally well staffed and supported by the latest in instrumentation.

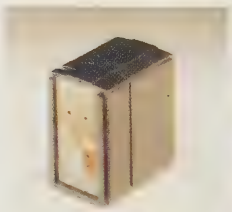
We produce custom enclosures for other equipment manufacturers and a standard catalog line of metal enclosures. We produce custom tools and dies for many manufacturers in the region. This unique combination of in-house processes ensures our ability to produce equipment of the highest quality, reliability and value.

We are proud of our reputation for customer service and product support. Our philosophy is that a sale is the beginning of a happy relationship. We provide service on our products that have been discontinued for many years, and we do so promptly and at an honest charge. Ten-Tec solves communications problems. If you have a special need, try us. We may have a cost effective solution. Your inquiry will be most welcome.

Ten-Tec manufactures communications electronics for non-amateur radio applications too. Some are custom designs for special applications and some are treated as catalog products. A few examples of "catalog" products are:

AVIATION HAND-HELD TRANSCEIVER, Model TT-920.

The TT-920 is a fully synthesized, full featured, AM transceiver that operates in the aviation COM/NAV band of 108. to 136. MHz. All 720 COM channels and 200 NAV channels are included. In addition, the transmit and receive frequencies can be "split" which allows air/ground communications through the 200 NAV channels. Ten programmable memories and instant recall of the emergency channel. Memory scan and band scan are programmable. The TT-920 is the most compact hand-held transceiver available that accepts standard aviation microphone and headphone plugs. A full line of accessories is available.



HF-SSB TRANSCEIVER, Model 150 Series.

This is a 100 watt PEP transceiver that operates in the 2 to 12 MHz range. "No-tune" solid state design is ideal for non-technical operators. All modes. Primary power is 12/14 Vdc. Ideal for mobile or base operation. Excellent receive and transmit performance, channelized for simplicity, highly reliable, compact and weighs only 10 lbs.

HF-SSB MANPACK TRANSCEIVER, Model 120 Series.

The 120 Series is available in three models that operate in the 3 to 5 MHz, 5 to 8 MHz or 8 to 12 MHz bands, 20 watts PEP. The unit is powered by a self-contained re-chargeable ni-cad battery. Completely portable, small, lightweight (10 lbs. including battery pack), all solid state, built-in antenna and channelized to customer specifications.

TEN-TEC
Highway 411 East
Sevierville, TN 37862, U.S.A.
(615) 453-7172

MADE IN USA

TEN-TEC AMATEUR RADIO EQUIPMENT

The Paragon, Performance Plus Model 585

All mode versatility and a transmitted signal you will be proud of. A receiver that has set new standards for sensitivity and quietness. Receives from 100 kHz to 29.999.99 MHz. Transmits on all bands from 1.8 MHz to 29.999.99 MHz with 100 watts output. SSB, CW, real FSK and optional FM. Standard equipment includes speech processor, noise blanker, dual VFOs, TX split, RX split and QSK with a changeover time of 30 ms or less. Five I-F filter positions with the 6 kHz AM filter and 2.4 kHz SSB filter, standard. Optional 1.8 kHz, 500 Hz and 250 Hz filters are selectable independent of mode. Two selectable tuning rates. Passband tuning, notch filter, audio bandpass filter, tone control, squelch and more!

Sixty-two programmable memories that store frequency, mode, filter selected, channel number and a 7 character alpha-numeric "tag" for entering channel I.D., tuner or amplifier settings, etc. Scan rate is selectable and as each memory is scanned all of the stored information is displayed (what a light show!). Alternately, the memories can be tuned with the main tuning knob.

Frequency selection is with the main tuning knob, direct keypad entry or up/down buttons that will shift in one kHz or one MHz increments or to the next ham band. DISPlay button selects 24 hour clock or date or tag. VOICE button causes a voice frequency announcement with optional synthesized voice board installed.

Rear panel controls are provided to adjust the VOX, CW monitor level and tone, and SSB sidetone monitor level. Switching is provided to control conventional linear amplifiers and of course, high speed switching for QSK linears, such as the Titan. Other rear panel inputs and outputs for transverters, FSK (170 Hz shift), fixed level audio out, audio in, external speaker, aux dc jack and provision for the optional RS-232 control interface. An absolute delight for the all mode operator.

The Paragon is the result of a three year engineering effort. We are proud of the Paragon and we think it has set new standards of excellence in synthesized rigs. Check it out yourself. We think that you will share our pride in the Paragon.

GENERAL SPECIFICATIONS

Frequency Range: Receive: 100 kHz to 29.9999 MHz. Transmit: 1.6 to 29.9999 MHz.
Frequency Control and Readout: Microprocessor controlled digital PLL synthesizer. 10 Hz resolution.
Frequency Stability: Worst case, 1 PPM per degree C at 29.999 MHz.
Frequency Accuracy: ± 100 Hz @ 25 degrees C.
Antenna Impedance: 50 ohm unbalanced.
PC Boards: 14 double-sided, 9 single-sided .062" glass-epoxy.
Power Required: Receive = 1.5A. Transmit = 20A. 12 - 14 VDC.
Dimensions: HWD 5¾" x 14¾" x 17". (14.6 x 27.3 x 43.2 cm).
Net Weight: 16 lbs. (7.25 kg).

TRANSMITTER

Modes: USB & LSB (J3E), CW (A1A), FSK (F1A); FM (F3E) optional (Model 256).
DC Power Input: Maximum 200 watts.
RF Power Output: ALC stabilized, adjustable, 25 to 100 watts (into 50 ohms) with front panel RF OUT control.
Microphone Input: Low impedance, bias voltage for electret provided.
CW Sidetone: Internally generated, adjustable tone and volume independent of AF GAIN control.
SSB Generation: 9 MHz, 8-pole crystal ladder filter. Balanced modulator.
Carrier Suppression: Greater than 60 dB.
Unwanted Sideband Suppression: Greater than 60 dB at 1.5 kHz AF input.
Harmonic Emissions: Greater than 45 dB below peak power output.
Spurious Output: Greater than 50 dB below peak power output.
Third Order Intermod Products: -30 dB from two-tone at 100 watts PEP.
Metering: Switchable forward power, SWR, collector current or audio processing level on SSB.
CW Offset: 750 Hz automatic.
FSK Shift: 170 Hz.
Transmit Offset Tuning Range: ± 99.9 kHz.

RECEIVER

Modes: USB, LSB, CW, FSK, AM, (FM optional).
Sensitivity:

	.1-1.6 MHz	1.6-29.999 MHz	
SSB/CW/RTTY	.5 uV	.15 uV	10 dB S/N@ 2.4 kHz
AM	3.5 uV	1.0 uV	10 dB S/N @ 6.0 kHz
FM	1.0 uV	.3 uV	12 dB SINAD @ 15 kHz

Selectivity:

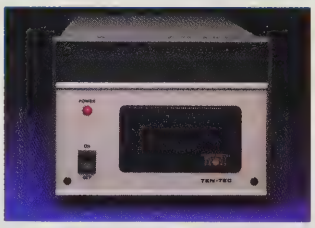
	-6 db BW	-60 dB BW	Shape Factor
Standard AM	6.0 kHz	11.24 kHz	1.875:1
Standard SSB	2.4 kHz	3.36 kHz	1.87:1
Opt. 1.8 kHz SSB (Model 288)	1.8 kHz	2.9 kHz	1.60:1
Opt. 500 Hz CW (Model 285)	500 Hz	1.4 kHz	2.80:1
Opt. 250 Hz CW (Model 282)	250 Hz	.85 kHz	3.40:1
Standard FM	15 kHz	30 kHz	2.00:1

Attenuator: -20 dB for 1.6 to 29.999 MHz, -10 dB for .1 to 1.6 MHz.
I-F Frequencies: 1st = 75 MHz, 2nd = 9.0 MHz, 3rd = 6.3 MHz (FM 3rd = 455 kHz).
Image Rejection: Greater than 80 dB.
I-F Rejection: Greater than 70 dB.
Noise Blanker: Switchable on/off with adjustable width.
Dynamic Range: 100 dB.
Blocking Dynamic Range: ± 16 dBm for 1 dB compression of an S9 signal, frequency offset = 50 kHz. -2 dBm for 1 dB compression of an S3 signal, frequency offset = 50 kHz.
Third Order Intercept: + 18 dBm.
Noise Floor: -132 dBm @ 2.4 kHz BW.
Squelch Sensitivity: Less than .6 uV.
Receiver Recovery Time: Less than 27 ms.
Receiver Offset Tuning Range: ± 99.9 kHz.
Pass Band Tuning I-F Shift: ± 1.2 kHz.
Audio Output: 1.5 watts @ 8 ohms.
Notch Filter: 250 to 2.2 kHz, greater than 50 dB notch depth.
Audio Bandpass Filter: 4 pole, variable center frequency 220 to 1.7 kHz, 35% bandwidth @ -6 dB.
Tone Control: Variable 15 dB rolloff @ 5 kHz.

PARAGON/OMNI V ACCESSORIES

SPEAKER/POWER SUPPLY

Designed for use with any Ten-Tec 100 watt rig. This highly regulated and very well filtered power supply uses 105 to 125 or 210 to 250 Vac 50/60 Hz, primary power, fuse protected. The output voltage is adjustable from 11.5 to 15 Vdc, factory adjusted to 13.8 Vdc and "over-voltage" protection is incorporated. Regulation is better than 3%, from "no load" to "full load." A re-setting, electronic latching circuit breaker limits current for the protection of the power amplifier and is adjustable. Maximum load is 22 A. Ripple is less than 20 mV peak-to-peak at 20 A. The front panel mounted speaker is a ceramic magnet dynamic, 8 Ohm. The dc output cable is terminated into a 4 pin AMP MATE-N-LOC® which connects to any Ten-Tec transceiver. Two rear panel phono jacks may be used to supply dc to low power accessories.
Size: HWD 5.25" x 7.5" x 13.5" (13.3 x 19 x 34.3 cm).
Weight: 18 lbs. (8.2 Kg).



Model 961, Speaker/Power Supply

Model 256, FM Board.

This easily installed module adds FM transmit and receive capability. System bandwidth is 5 kHz.

Model 257, Voice Synthesizer Board.

This plug-in board announces the frequency displayed when the VOICE button is pressed.

Model 259, Universal ALC Annunciator.

This is great for the vision impaired operators and can be installed in any transceiver with ALC. When the mic gain is advanced to the proper level, a beep sounds.

The OMNI V Model 562

The OMNI V is a Paragon with a 12 band crystal mixed local oscillator in place of the general coverage synthesized oscillator. The result is receiver cleanliness like the legendary Corsair and Omni series. The OMNI V local oscillator is a new ultra low noise 5.0 to 5.5 MHz PLL design. Phase noise is simply eliminated as a significant variable. Dynamic range is maintained right up to the edges of the crystal filters, even under the most adverse conditions.

Many of the nifty features made possible by digital technology are included. Dual VFO's with A-B-split select, the frequency stability of a PLL, 25 tuneable memories, VFO to MEM, MEM to VFO and the SCRATCHPAD feature. RS-232 interface is standard and includes remote band switching for the HERCULES II amplifier. The memories are nonvolatile RAM and are retained until you change them. The status registers and clock are backed with a lithium battery (2 year life) so that when the rig is powered up, the status is the same as when you turned it off.

The OMNI V operates USB, LSB, fast or slow QSK CW and real FSK. FM is optional. All bands from 160 through 10 meters are push button selectable. Each band position covers 500 kHz plus 30 kHz over-shoot at the band edges. The four 500 kHz segments of the 10 meter band are switched automatically as you tune through the segment limits. Tuning is in your choice of 10 Hz or 50 Hz increments on SSB, CW and FSK. With the FM option, tuning is in 100 Hz or 500 Hz increments. Up/Down buttons tune in 10 kHz or 50 kHz increments.

An auxiliary frequency tuning system is available and plugs into the rear panel. This allows you to remotely tune the frequency from the most convenient and comfortable position. It takes about 10 ms to fall in love with this option.

A noise blanker and audio speech processor are standard equipment as is the cw sidetone and speech monitor. The rear panel has a full complement of inputs, outputs and controls for the convenience of the all-mode operator, including an auxiliary RX antenna input. High speed key lines are provided for QSK control of a fast switching amplifier, such as the TITAN or HERCULES II. Changeover in fast QSK is less than 30 ms, great for CW and the digital modes.

The front panel is spacious and friendly. The vacuum fluorescent display uses large, bright, easy to read elements. The frequency display doubles as the 24 hour clock display when the CLOCK button is pressed. Other elements indicate VFO status and warn when the memories are full.

All four of the 6.3 MHz I-F crystal filter positions are push-button selectable, independent of mode. A second filter socket is also provided, in series, behind the standard 2.4 kHz filter in the 9 MHz I-F. This may be used for an optional 2.4 kHz, 1.8 kHz, 500 Hz or 250 Hz filter which is selected with the "NARROW" button. This adds six or eight poles into the crystal filter network and even further reduces the impact of adjacent strong signals. Most impressive!

If you do not need a general coverage receiver in your HF rig, the elegant OMNI V is a great choice. If you are also a serious DX-er and/or contester, the OMNI V is the best choice.

GENERAL SPECIFICATIONS

Frequency Range: Transmit and receive on all ham bands from 160 through 10 meters in their entirety. Twelve 500 kHz segments plus 30 kHz over-shoot at the upper and lower edges of the segments.
Frequency Control: LO generated from a crystal oscillator mixed with a low noise 5.0 - 5.5 MHz phase locked loop.
Frequency Stability: Worst case, 1 PPM per degree C at 29.999 MHz.
Frequency Accuracy: +–100 Hz @ 25 degrees C.
Antenna Impedance: 50 Ohms, unbalanced.
Printed Circuit Boards: G-10 epoxy glass.
Power Required: Receive = 1.5 A. Transmit = 20 A. 12 - 14 Vdc.
Dimensions: HWD 5¾" x 14¾" x 17". (14.6 x 27.3 x 43.2 cm).
Net Weight: 16 lbs. (7.25 kg).

TRANSMITTER

Modes: USB and LSB (J3E), CW (A1A), FSK (F1A). Optional FM (F3E).
DC Power Input: 200 watts maximum.
RF Power Output: ALC stabilized, adjustable from 20 watts to 100 watts (50 Ohm load) with front panel RF OUT control.
Microphone Impedance: 200 Ohms to 50k Ohms. Bias voltage for electret mic is provided in front panel connector.
CW Sidetone: Internally generated with rear panel level and tone adjustments, independent of front panel audio level control.
SSB Generation: 9 MHz, 8 pole crystal ladder filter, balanced modulator.
Carrier Suppression: Greater than 60 dB.
Unwanted Sideband Suppression: Greater than 60 dB at 1.5 kHz AF input.
Harmonic Emissions: Greater than 45 dB below peak power output.
Third Order Intermod Products: –30 dB from two tone at 100 watts PEP.
Metering: Switchable forward power, SWR, collector current or audio processing level on SSB.
CW Offset: 600 Hz.
FSK Shift: 170 Hz.

RECEIVER

Modes: LSB, USB, CW and FSK. FM with optional board.
Sensitivity: .15 uV for 10 dB signal to noise ratio at 2.4 kHz bandwidth. With FM option, .3 uV for 12 dB SINAD at 15 kHz bandwidth.
Selectivity:

	–6 dB BW	–60 dB	Shape Factor
Standard 2.4 kHz	2.4 kHz	3.36 kHz	1.87:1
Opt. 1.8 kHz	1.8 kHz	2.90 kHz	1.60:1
Opt. 500 Hz	500 Hz	1.40 kHz	2.80:1
Opt. 250 Hz	250 Hz	.85 kHz	3.40:1
Opt. FM	15 kHz	30.00 kHz	2.00:1

Attenuator: –20 dB.
I-F Frequencies: 1st I-F 9 MHz, passband tuning I-F 6.3 MHz.
Image Rejection: ►100 dB.
I-F Rejection: ►60 dB average.
Noise Blanker: Switchable on/off with width adjustment.
Dynamic Range: 97 dB, measured with standard 2.4 kHz filter at 20 kHz spacing. 100 dB + with cw filters.
Third Order Intercept: +10 dBm.
Noise Floor: –133 dBm @ 2.4 kHz bandwidth.
Squelch Sensitivity: Less than .6 uV.
Receiver Recovery Time: Less than 30 ms.
Pass Band Tuning I-F Shift: +–2.3 kHz.
Audio Output: Speaker, 1.5 watts @ 8 Ohms. Fixed level 1 mw @ 600 Ohms.
Notch Filter: 250 Hz to 2.2 kHz, greater than 50 dB notch depth.
Audio Bandpass Filter: 4 pole, variable center frequency 220 Hz to 1.7 kHz, 35% band width @ –6 dB.
Tone Control: Variable 15 dB roll-off @ 5 kHz.
Phase Noise Performance of the OMNI V: –127 dBc/Hz @ 250 Hz offset from carrier. –146 dBc/Hz @ 5 kHz offset from carrier.

9 MHz I-F FILTERS FOR OMNI V

MODEL 216.
Special 500 Hz, 6 pole crystal ladder filter centered for operation on the digital modes. (RRTY, packet and AMTOR.)
MODEL 217.
500 Hz, 8 pole crystal ladder cw filter.
MODEL 218.
1.8 kHz, 8 pole crystal ladder ssb filter.
MODEL 219.
250 Hz, 6 pole crystal ladder cw filter.
MODEL 220.
2.4 kHz 8 pole crystal ladder ssb filter.

6.3 MHz I-F FILTERS FOR OMNI V AND PARAGON.

MODEL 282.
250 Hz, 6 pole crystal ladder filter for cw or the digital modes.
MODEL 285.
500 Hz, 6 pole crystal ladder filter for cw or the digital modes, for Paragon. (Built into OMNI V.)
MODEL 288.
1.8 kHz, 8 pole crystal ladder ssb filter.

Model 258, RS-232 Interface Board.
Provides remote computer control of frequency, mode, filter selection, VFO selection, all memory and scan features including memory programming and the other functions controlled from the push-button panel on the face of the Paragon. Supplied with command data for writing the program. Program discs are available from Ten-Tec for some of the more popular computers.

The DELTA II Model 536

The Delta II is a full featured transceiver designed for base, mobile or portable operation. Simplified all mode operation without compromising performance! Synthesized PLL design provides general coverage from 100 kHz to 30 MHz. Our unique new Jones I-F filter system (patent pending) is standard equipment. This is an eight pole crystal ladder filter design with a continuously variable bandwidth from 500 Hz to 2.4 kHz. Outstanding selectivity that is operator optimized for ssb, cw or the digital modes. Passband tuning is digitally controlled, variable ±-2.5 kHz. Standard AM and FM filters are mode selected. The Delta II delivers outstanding receiver performance, in the ham bands or anywhere in between.

The transmitter power is continuously variable from 100 watts to less than 20 watts output. Superb ssb performance with front panel adjustment of the "set and forget" VOX gain, delay and anti-VOX controls using our new "soft touch" control system. Noise blanker, speech processor and the FM transceive mode are all standard features.

QSK cw performance and a keyed wave from that will embarrass some big rigs (not ours) costing several times more. Independent, ±-1.27 kHz, offset tuning that tracks when using the main frequency tuning control. Cw sidetone with variable pitch and volume. Push-button activated reference tone is used to net another cw signal, exactly.

Rear panel connections are provided for amplifier control, audio in and out, cw key, PTT, band information and remote control interface.

Dual VFOs with A = B, A/B and SPLIT. In SPLIT, use the momentary REVerse button to receive on the transmit VFO to "pick and set" your transmit frequency. This feature allows strategic positioning in a pile-up. Frequency is entered with the numeric key pad or tuned with UP/DOWN buttons in 100 kHz or 1MHz steps. Use the FUNCTION-UP/DOWN buttons to scroll through the 9 ham bands.

Other features include variable tuning rates from 10 Hz to 500 Hz, selected with FAST button and mode. Thirty-one memories. Ten of the memories can be programmed for split frequencies. Scratch pad for temporary storage of frequency and mode, with single button recall. Memory recall by channel number or using memory tune.

The LCD display panel holds contrast, even in direct sunlight. Frequency, VFO status, mode, memory channel, 24 hour clock, receive offset frequency and multi-function bar-graph meter are all an integral part of the display. Back lighting is provided with an electro-luminescent panel which may be turned on/off.

The Delta II is built to travel. At the same time, modern technology has been applied to deliver "big rig" performance and reliability. All you need to add is a source of 12 Vdc and an antenna.

GENERAL SPECIFICATIONS

Frequency Coverage: Transmit all ham bands, 160 through 10 meters. Receive 100 kHz to 29.999.99 MHz.
Frequency Control and Read-Out: Microprocessor controlled, digital phase locked loop synthesizer. 10 Hz resolution.
Frequency Accuracy: ±-100 Hz @ 25 degrees C.
Frequency Stability: Worse case, 1 PPM per degree, 0-50 C.
Dual VFO Control System: A/B selects A or B VFO. A = B nets both VFOs to mode and frequency. SPLIT allows independent transmit/receive frequency control. REVerse momentarily switches to opposite VFO to listen to or set transmit frequency when operating SPLIT. Can operate cross band and mode.
VFO Tuning Rates: 10 Hz or 50 Hz selectable with FAST button in ssb or cw. 100 Hz or 500 Hz in FM or AM modes.
Memory System: Non-volatile RAM. 31 total. 10 may be programmed for split frequency combinations. Store by channel number or random to an available channel. Recall by channel number or select using memory tune function.
Display: Liquid crystal. Electro-luminescent back lighted panel with on/off switch.
Dial Lock: Adjustable drag.
RS-232 via ⅛" mini jack.
Rear Panel Connections: DIN connector A; band information. DIN connector B; fixed level audio in/out, PTT, TX EN/TX OUT, QSK amplifier control, mic mute (use with AFSK), amplifier control line (non-QSK), foot switch (mutes speaker and activates "T" line) and ground. Separate jacks for external speaker, cw key, AUX 13.5 Vdc and a thermostatically controlled dc line for external cooling for "key-down" modes.
Primary Power: 11 to 14.5 Vdc @ 20 A.
Antenna Impedance: 50 Ohms, unbalanced.
Printed Circuit Boards: G-10 epoxy glass.
Dimensions: HWD 3.75" x 9.75" x 14.0" overall. (9.53 x 24.8 x 35.6 cm).
Net Weight: 10 lbs, 10 oz. (4.82 kg).

TRANSMITTER

Modes: LSB, USB, CW, FM. Digital modes using externally generated AFSK. **AM transmit not provided.**
RF Output: Continuously variable, using front panel control, from 100 watts to less than 20 watts.
Microphone Input: 250 to 50,000 Ohms, dc bias voltage for electret element provided.
CW Sidetone: Internally generated, adjustable volume, using front panel "soft touch" system, independent of receiver volume control. Tone frequency internally adjustable.
SSB Generation: Double sideband modulator. 8 pole crystal ladder filter.
Carrier Suppression: Greater than 60 dB.
Unwanted Sideband Suppression: Greater than 50 dB @ 1.5 kHz AF input.
Harmonic Emissions: Greater than 45 dB below peak power output.
Spurious Output: Greater than 50 dB below peak power output.
Third Order Intermod Products: -30 dB from two tone at 100 watts output.
Metering: Forward power, SWR in transmit. S-meter in receive. Indicates control settings in "soft touch" adjust mode.
CW Offset: Factory preset 500 Hz, field programmable.
VOX System: VOX gain, delay and anti-VOX are front panel adjustable using our "soft touch" control system.

RECEIVER

Modes: USB, LSB, CW, FM, AM and digital modes.
Sensitivity:

Mode	.1 to 1.6 MHz	1.6 to 29.999.99 MHz
SSB/CW/AFSK	.5 uV	.25 uV
AM	3.5 uV	1.00 uV
FM	1.0 uV	.30 uV

Selectivity: 8 pole, crystal ladder I-F filter with continuously variable band-width, from 500 Hz to 2.4 kHz, used in cw, ssb and digital modes. FM and AM modes automatically select built-in filters.
Attenuator: -20 dB, .1 to 29.999 MHz.
I-F Frequencies: 1st = 45 MHz, 2nd = 6.144 MHz. (FM mode 3rd = 455 kHz).
Image Rejection: Greater than 80 dB.
I-F Rejection: Greater than 70 dB.
Noise Blanker: Switchable, ON/OFF.
Dynamic Range: 95 dB, typical.
Noise Floor: -129 dBm. (.25 uV for +10 dB s/n in ssb)
Squelch Sensitivity: Less than .6 uV.
Receiver Recovery Time: Less than 27 ms.
Receiver Offset w/RXO Control: ±-1.27 kHz with digital display.
Passband Tuning: Digitally controlled, ±-2.5 kHz.
BFO: Digitally controlled, phase locked loop.
Audio Output: 1.5 watts @ 8 Ohms, less than 2% THD.
Notch Filter: .250 to 2.2 kHz, greater than 50 dB notch depth.

Specifications subject to change.

AVAILABLE NOVEMBER 1990

DELTA II/ARGONAUT II ACCESSORIES

Model 936.
Portable power supply for the Delta II. Output is adjustable from 11.5 to 15 Vdc, factory set for 13.8 Vdc. Adjustable electronic current trip circuit, 22 amps max. Primary power switchable for 105/125 Vac or 210/250 Vac, 50 - 60 Hz, fused. DC output into a 5 foot, 2 conductor #14 cable terminated in a 2 conductor AMP Mate-N-Lock connector which mates with the Delta II dc input connector. Two AUX dc outputs through RCA phono jacks for low power accessories.
Size: HWD 3¾" x 5½" x 12".
Weight: 18 lbs.

MODEL 290, STEP ATTENUATOR.
Reduces pass-through power in six, switch selected, calibrated steps from five watts to 10 mw. A great accessory for the Argonaut II and the true QRP experimenter.

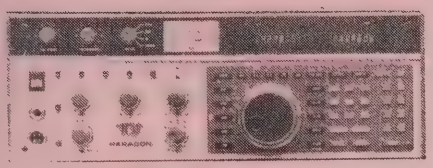
UNIVERSAL ACCESSORIES

CIRCUIT BREAKER
1140 DC Models 546/560/561/562/580/585.

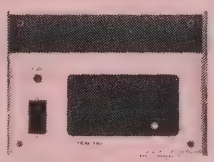
HIGHWAY 411 EAST SEVIERVILLE, TENNESSEE 37862 (615) 453-7172

TEN-TEC INC

PRICE SCHEDULE

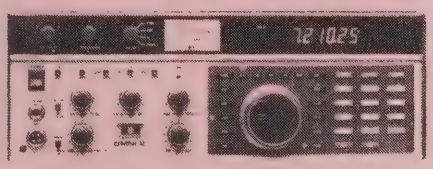


MODEL 585 PARAGON

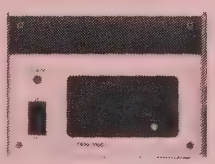


MODEL 961
POWER SUPPLY

MODEL	DESCRIPTION	Shp. Wt. lbs/Kg (oz/gm)	HAM NET
585	PARAGON General Coverage HF Transceiver, 200 W. SSB/CW/FSK,1.8-30 MHz	24/10.9	2245.00
961	Power Supply, 115/230 VAC, 13.5 VDC, 22 A, built-in Spkr.	21/9.5	269.00
282	250 Hz 6 Pole Crystal Ladder Filter, 6.3 MHz	(3/85.)	74.00
285	500 Hz 6 Pole Crystal Ladder Filter, 6.3 MHz	(3/85.)	74.00
288	1.8 KHz 8 Pole Crystal Ladder Filter, 6.3 MHz	(3/85.)	74.00
604	Dual Paddle Iambic Electronic Keyer	2/0.9	165.00
605	Single Paddle Electronic Keyer	2/0.9	84.00
700C	Handheld Mic., Electret with Coiled Cord and Connector	1/0.45	43.00
705	Desk Microphone, Electret, with Coiled Cord and Connector	1/0 45	83.00
1140	DC Circuit Breaker, for Models 580/560/561/546/585	(3/85.)	18.00
256	FM Transceive Module	1/0.45	65.00
257	Voice Synthesizer	(3/85.)	89.00
258	RS-232 Interface	(3/85.)	65.00
258-IBM	Serial Communications Software for IBM PC/XT	(3/85.)	10.00
258-COM	Serial Communications Software for COMMODORE 128	(3/85.)	10.00
259	Universal ALC Annunciator	(3/85.)	39.00
80-572	Spare, 4 Pin DC Connector	(3/85.)	1.50
35057	4 Pin Microphone Connector	(3/85.)	2.50
RM-500	Rack mount kit, 562/585.	2/0.9	25.00



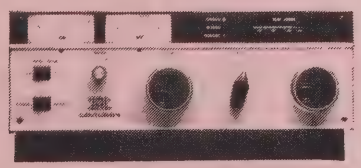
MODEL 562 OMNI V



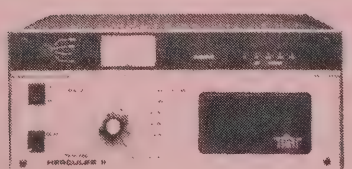
MODEL 961
POWER SUPPLY

MODEL	DESCRIPTION	Shp. Wt. lbs/Kg (oz/gm)	HAM NET
562	OMNI V HF Transceiver, 200 W., SSB/CW, 9 Band	24/10.9	2245.00
961	Power Supply, 115/230 VAC, 13.5 VDC, 22 A, built-in Spkr.	21/9.5	269.00
216	500 Hz 6 Pole FSK Filter, 9 MHz	(3/85.)	74.00
217	500 Hz 8 Pole Crystal Ladder Filter, 9 MHz	(3/85.)	74.00
218	1.8 KHz 8 Pole Crystal Ladder Filter, 9 MHz	(3/85.)	74.00
219	250 Hz 8 Pole Crystal Ladder Filter, 9 MHz	(3/85.)	74.00
220	2.4 KHz 8 Pole Crystal Ladder Filter, 9 MHz	(3/85.)	74.00
282	250 Hz 6 Pole Crystal Ladder Filter, 6.3 MHz	(3/85.)	74.00
285	500 Hz 6 Pole Crystal Ladder Filter, 6.3 MHz	(3/85.)	74.00
288	1.8 KHz 8 Pole Crystal Ladder Filter, 6.3 MHz	(3/85.)	74.00
301	Remote Frequency Tuning Control, for Model 562	2/0.9	84.00
604	Dual Paddle Iambic Electronic Keyer	2/0.9	165.00
605	Single Paddle Electronic Keyer	2/0.9	84.00
700C	Handheld Mic., Electret with Coiled Cord and Connector	1/0.45	43.00
705	Desk Microphone, Electret, with Coiled Cord and Connector	1/0.45	83.00
1140	DC Circuit Breaker, for any 100 Watt rig	(3/85.)	18.00
256	FM Transceive Module	1/0.45	65.00
257	Voice Synthesizer	(3/85.)	89.00
259	Universal ALC Annunciator	(3/85.)	39.00
80-572	Spare, 4 Pin DC Connector	(3/85.)	1.50
35057	4 Pin Microphone Connector	(3/85.)	2.50
RM-500	Rack mount kit, 562/585.	2/0.9	25.00

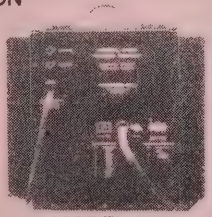
MODEL 425
TITAN



MODEL 422 CENTURION

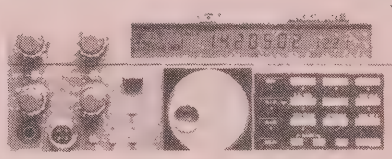


MODEL 420 HERCULES II



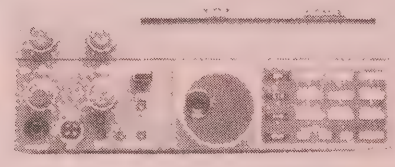
MODEL 9420
POWER SUPPLY

MODEL	DESCRIPTION	Shp. Wt. lbs/Kg (oz/gm)	HAM NET
425	TITAN Linear Amplifier, 1.5 KW output, 1.8-23 MHz, with Power Supply (UPS Shippable)	67/30.4	3250.00
425E	TITAN Linear Amplifier, 1.5 KW output, 1.8-31 MHz, with Power Supply (For Export Only)	67/30.4	3250.00
RM-425	Rack mount kit, Titan 425	2/0.9	25.00
422	CENTURION Linear Amplifier, 1.0 KW output, 1.8-23 MHz, with built-in Power Supply	57/25.8	1995.00
422WO	CENTURION Linear Amplifier, 1.0 KW output, 1.8-23 MHz, with built-in Power Supply, without tubes	57/25.8	1695.00
422E	CENTURION Linear Amplifier, 1.0 KW output, 1.8-23 MHz, with built-in Power Supply (For Export Only)	57/25.8	1995.00
422EWO	CENTURION Linear Amplifier, 1.0 KW output, 1.8-23 MHz, with built-in Power Supply, without tubes (For Export Only)	57/25.8	1695.00
81-561	Vaccum Relay Board for Model 422	(3/85.)	93.00
420	HERCULES II Linear Amplifier, 500 W output, Solid State No Tune, 1.8-22 MHz, 13.5 Vdc.	21/9.5	1395.00
420E	HERCULES II Linear Amplifier, 500 W output, Solid State No Tune, 1.8-30 MHz, 13.5 Vdc. (For Export Only)	21/9.5	1395.00
RM-420	Rack mount kit, Hercules II 420	2/0.9	25.00
236	Remote Control Cable, 562 or 585 to either Model 253 or 420	1/0.45	57.00
264	236 Expansion Cable, Model 253/420 combination to 562 or 585	1/0.45	32.00
300	Remote Control Extension Cable, 12 FT., for Model 9423	1/0.45	45.00
9420	Power Supply for HERCULES II and Exciter, 230 VAC, 13.5 Vdc. @ 100 A. (Shipped via Motor or Air Freight)	64/29.0	850.00
9421	Spare DC Power Connector, for Model 420	1/0.45	8.50
9422	DC Power Pigtail, for Model 420 Mobile Installation	6/2.7	23.00
9423	Remote Control Head with 12 FT. Cable, for Model 420	9/4.1	147.00



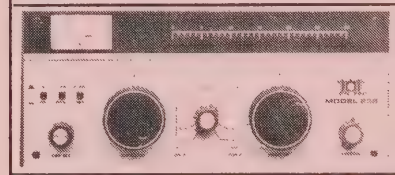
MODEL 535 ARGONAUT II

MODEL	DESCRIPTION	Shp. Wt. lbs/Kg (oz/gm)	HAM NET
535	ARGONAUT II, QRP G.C. HF Transceiver, 10W.,SSB/CW	16/7.3	1445.00
290	Step Attenuator, 5 Watt maximum input, for Model 535	1/0.45	37.00
291	200 Watt Bare Bones Antenna Tuner	3.5/1.6	105.00
604	Dual Paddle Iambic Electronic Keyer	2/0.9	165.00
605	Single Paddle Electronic Keyer	2/0.9	84.00
606	Single Paddle Curtis Chip Keyer, Ultra Low Current	2/0.9	92.00
700C	Handheld Mic., Electret with Coiled Cord and Connector	1/0.45	43.00
705	Desk Microphone, Electret, with Coiled Cord and Connector	1/0.45	83.00
935	Power Supply, 120-250 VAC, 12 VDC, 2A	9/4.1	89.00
80-572	Spare, 4 Pin DC Connector	(3/85.)	1.50
35057	4 Pin Microphone Connector	(3/85.)	2.50



MODEL 536 DELTA II

536	DELTA II, G.C. HF Transceiver, 200W.,SSB/CW, 0.1-30 MHz	17/7.7	1695.00
291	200 Watt Bare Bones Antenna Tuner	3.5/1.6	105.00
293	Mobile Mount for 535/536	3.5/1.6	53.00
303	Fan Kit for 536 Key Down Modes	4/1.8	30.00
604	Dual Paddle Iambic Electronic Keyer	2/0.9	165.00
605	Single Paddle Electronic Keyer	2/0.9	84.00
606	Single Paddle Curtis Chip Keyer, Ultra Low Current	2/0.9	92.00
700C	Handheld Mic., Electret with Coiled Cord and Connector	1/0.45	43.00
705	Desk Microphone, Electret, with Coiled Cord and Connector	1/0.45	83.00
936	Power Supply, 115-230 VAC, 13.8 VDC, 22A	18/8.2	249.00
80-572	Spare, 4 Pin DC Connector	(3/85.)	1.50
35057	4 Pin Microphone Connector	(3/85.)	2.50

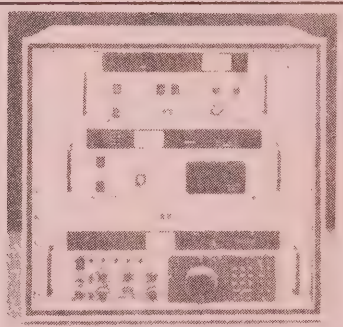


MODEL 238
2KW ANTENNA TUNER

236	Remote Control Cable, 562 or 585 to either Model 253 or 420	1/0.45	57.00
238	2 KW Antenna Tuner/SWR Bridge	13/5.9	395.00
239	300 Watt Dummy Load	1/0.45	32.00
240	1.5 KW Dry Dummy Load	9/4.1	243.00
253	1.5 KW Automatic Antenna Coupler	13/5.9	1150.00
254	200 W. Antenna Tuner / SWR Bridge	9/4.1	199.00
264	236 Expansion Cable, Model 253/420 combination to 562 or 585	1/0.45	32.00

MODEL 253
1.5KW AUTOMATIC
ANTENNA COUPLER

RM-253	Rack mount kit, Ant coupler 253	2/0.9	25.00
5060	TVI Highpass Filter	1/0.45	16.00
5061	Lowpass Line Filter	2/0.9	99.00
23227	Variable Capacitor, 1-207 pF @ 1kv, as used in Model 254	1/0.45	21.00
80-402	Tapped Inductor, 47 steps, 0.1-20 μH, as used in Model 254	1/0.45	24.00
80-858	Variable Capacitor, 40-500 pF @ 3.5kv, as used in Model 238	2/0.9	58.00
81-040	Roller Inductor, 0.1-19 μH, silver plated, as used in Model 238	2/0.9	62.00

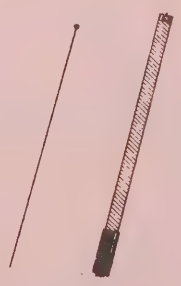


RM-420	Rack mount kit, Hercules II 420	2/0.9	25.00
RM-425	Rack mount kit, Titan 425	2/0.9	25.00
RM-500	Rack mount kit, 562/585	2/0.9	25.00
RM-253	Rack mount kit, Antenna Coupler 253	2/0.9	25.00
RM-P0175-19	1-3/4" Blank Panel	1/0.45	8.45
RM-P0700-19	7" Blank Panel	2/0.9	20.60
RM-19-1750	19" Cabinet with 17-1/2" opening, with side hand grips	35/15.9	285.00

**Note: Slide rails are not included with Rack Mount kits and are not available at this time.

MODEL 2510B MODE "B"
SATELLITE STATION

2510B	Satellite Station, Mode B, SSB/CW, contains Model 2511 Oscar 13 expansion board	9/4.1	745.00



HF MOBILE
ANTENNA SYSTEM

3001	Switchable Mobile Matcher for 20-80 Meter Bands	1/0.45	22.00
3101	Replacement Top Section Stinger, 42" Long	4/1.8	9.00
3101L	Replacement Top Section Stinger, 49" Long	4/1.8	9.00
4010	Mobile 10 Meter Antenna 72" High	4/1.8	30.00
4012	Mobile 12 Meter Antenna 72" High	4/1.8	30.00
4015	Mobile 15 Meter Antenna 72" High	4/1.8	30.00
4017	Mobile 17 Meter Antenna 72" High	4/1.8	30.00
4020	Mobile 20 Meter Antenna 72" High	4/1.8	30.00
4030	Mobile 30 Meter Antenna 72" High	4/1.8	37.00
4040	Mobile 40 Meter Antenna 78" High	4/1.8	37.00
4075	Mobile 75 Meter Antenna 78" High	4/1.8	37.00
4080	Mobile 80 Meter Antenna 78" High	4/1.8	37.00

This price list is effective March 15, 1991

MADE IN USA
TEN-TEC AMATEUR RADIO EQUIPMENT
America's Best!
POWER
N.B.
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PTT
VOX
QSK
FAST
SLOW
AGC
ON
OFF
FAST
SLOW
METER
PROC.
PHONES
ATTN
-20 dB
AF
TONE
FADE
BP
PBT
NOTCH
MIC
PROC
ON
MIC
DRIVE
ALC
PARAGON
RF
SQL
Linear Amplifier

NEW! Paragon, Model 585

PARAGON HF TRANSCEIVER, Model 585

Meet America's newest full featured, synthesized transceiver. General coverage all mode receiver tunes from 100 kHz to 29.999.99 MHz. Transmit at 100 watts output on all authorized frequencies from 1.8 to 29.999.99 MHz. SSB, CW, FSK and optional FM. Noise blanker and speech processor are standard equipment. Dual VFOs, RX offset, TX offset, QSK with a changeover time of less than 30 ms, five i-f filters (standard 6 kHz AM and 2.4 kHz SSB, optional 1.8 kHz, 500 Hz and 250 Hz) that are front panel selectable independent of mode, selectable tuning rates with automatic speed-up at rapid tuning knob rotation, passband tuning, audio bandpass filtering, tone control, squelch, notch filtering and more!

Sixty-two programmable memories that include frequency, mode, filter selected, channel number and a 7 digit alpha-numeric tag for entering a net name, call sign or I.D. of your choice. As the memory channels are scanned, all of the information is displayed (what a light show!) and the receiver automatically sets up mode, filters, tag and frequency as stored in each channel. Channels scanned are totally controllable with global lock-out, global reset and individual lock-out and reset.

The construction is impressive too. All circuit boards are glass epoxy (G-10) and all of them can be removed without desoldering. The front panel is hinged to provide access to all sections of the chassis. All aluminum construction keeps the weight of the rig reasonable too. And of course, the front panel is a spacious arrangement which makes the critical controls easy to use.

Frequency selection can be made using the main tuning knob, keypad direct entry or up/down buttons that can shift one MHz or to the next ham band. Frequency readout is selectable to display to 100 Hz or 10 Hz. Front panel clock is programmable for 12 or 24 hour format. Rear panel input and output provisions keep the all-mode operator in mind too. Fixed level audio out and FSK keying (170 Hz shift), auxiliary dc jacks for low power station accessories, amplifier control circuits plus all the other connections that you could possibly need, including RS-232 computer interface options.

The Paragon is the end result of a three year engineering effort. Much of that effort was invested in improving the receiver performance and controlling the phase noise inherent in a PLL oscillator. We are proud of the performance of the Paragon and we think it has set new standards of excellence in synthesized rigs. All we ask is that you take the time to check it out. We think that you will share our pride in the Paragon.

GENERAL SPECIFICATIONS

Frequency Range: Receive: 100 kHz to 29.9999 MHz. Transmit: 1.6 to 29.9999 MHz.
Frequency Control and Readout: Microprocessor controlled digital PLL synthesizer. 10 Hz resolution.
Frequency Stability: Worst case, 1 PPM per degree C. at 29.999 MHz.
Frequency Accuracy: ± 100 Hz @ 25 degrees C.
Antenna Impedance: 50 ohm unbalanced.
PC Boards: 14 double-sided, 9 single-sided .062″ glass-epoxy.
Power Required: Receive = 1.5A. Transmit = 20A. 12 - 14 VDC.
Dimensions: HWD 5¾″ x 14¾″ x 17″. 14.6 x 27.3 x 43.2 cm.
Net Weight: 16 lbs. 7.25 kg.

TRANSMITTER

Modes: USB & LSB (J3E), CW (A1A), FSK (F1A); FM (F3E) optional (Model 256).
DC Power Input: Maximum 200 watts.
RF Power Output: ALC stabilized, adjustable, 10 to 100 watts (into 50 ohms) with front panel RF OUT control.
Microphone Input: Low impedance, bias voltage for electret provided.
CW Sidetone: Internally generated, adjustable tone and volume independent of AF GAIN control.
SSB Generation: 9 MHz, 8-pole crystal ladder filter. Balanced modulator.
Carrier Suppression: Greater than 60 dB.
Unwanted Sideband Suppression: Greater than 60 dB at 1.5 kHz AF input.
Harmonic Emissions: Greater than 45 dB below peak power output.
Spurious Output: Greater than 50 dB below peak power output.
Third Order Intermod Products: -30 dB from two-tone at 100 watts PEP.
Metering: Switchable forward power, SWR, collector current or audio processing level on SSB.
CW Offset: 750 Hz automatic.
FSK Shift: 170 Hz.
Transmit Offset Tuning Range: ± 99.9 kHz.

RECEIVER

Modes: USB, LSB, CW, FSK, AM, (FM optional).
Sensitivity:

	.1 - 1.6 MHz	1.6 - 29.999 MHz	
SSB/CW/RTTY	.5 uV	.15 uV	10 db S/N@ 2.4 kHz
AM	3.5 uV	1.0 uV	10 dB S/N @ 6.0 kHz
FM	1.0 uV	.3 uV	12 dB SINAD @ 15 kHz

Selectivity:

	-6 dB BW	-60 dB BW	Shape Factor
Standard AM	6.0 kHz	11.25 kHz	1.875:1
Standard SSB	2.4 kHz	3.36 kHz	1.4:1
Opt. 1.8 kHz SSB (Model 288)	1.8 kHz	2.9 kHz	1.60:1
Opt. 500 Hz CW (Model 285)	500 Hz	1.4 kHz	2.80:1
Opt. 250 Hz CW (Model 282)	250 Hz	.85 kHz	3.40:1
Standard FM	15 kHz	30 kHz	2.00:1

Attenuator: -20 dB for 1.6 to 29.999 MHz, -10 dB for .1 to 1.6 MHz.
I-F Frequencies: 1st = 75 MHz, 2nd = 9.0 MHz, 3rd = 6.3 MHz (FM 3rd = 455 kHz).
Image Rejection: Greater than 80 dB.
I-F Rejection: Greater than 70 dB.
Noise Blanker: Switchable on/off with adjustable width.
Dynamic Range: 100 dB.
Blocking Dynamic Range: + 16 dBm for 1 dB compression of an S9 signal, frequency offset = 50 kHz. -2 dBm for 1 dB compression of an S3 signal, frequency offset = 50 kHz.
Third Order Intercept: + 18 dBm.
Noise Floor: -132 dBm @ 2.4 kHz BW.
Squelch Sensitivity: Less than .6 uV.
Receiver Recovery Time: Less than 27 ms.
Receiver Offset Tuning Range: ± 99.9 kHz.
Pass Band Tuning I-F Shift: ± 1.2 kHz.
Audio Output: 1.5 watts @ 8 ohms.
Notch Filter: 250 to 2.2 kHz, greater than 50 dB notch depth.
Audio Bandpass Filter: 4 pole, variable center frequency 220 to 1.7 kHz, 35% bandwidth @ -6 dB.
Tone Control: Variable 15 dB rolloff @ 5 kHz.

For the serious radio operator!

Titan, Model 425

TITAN, HF LINEAR AMPLIFIER, Model 425

The Titan has it all! Maximum legal power with ease, all bands 160 through 15 meters (10 and 12 meters after authorized modification), lightning fast QSK for break-in CW and the digital modes and a two speed blower for quiet operation. This awesome performance from a desk top amplifier is made possible by the remote power supply and a pair of Eimac® 3CX800A7 ceramic triodes. The heart of the power supply is our own tape wound Hypersil® transformer . . . nearly noiseless, even at 1500 watts output!

Other features include a front panel, peak reading wattmeter using an instantaneous ten element LED bargraph display, HI-LO plate voltage select, built-in SWR meter and an "overdrive" warning LED. Vernier TUNE and LOAD controls in combination with an outstanding RF deck design, make the Titan a real "pussy cat" to load and operate.

The low drive requirement of the 3CX800A7 tubes (50 watts for 1000 watts output typical) makes life much nicer for your exciter too. Operating temperatures are substantially lower and component life is extended accordingly. This is especially comforting using the "keydown" modes.

There is some interesting reading about the Titan in two rather thorough "Product Review" articles. See QST, April 1986; CQ, February 1986. Both articles discuss the technical aspect of this amplifier as well as operational details.

The Titan is designed to match our Corsair II and Paragon but it pairs up nicely, no matter what exciter you are using. If you are ready to choose your dream amplifier, the Titan has it all! Check it out.

SPECIFICATIONS

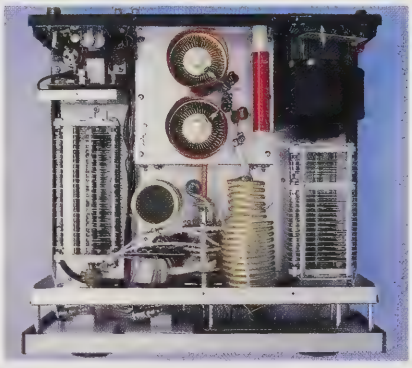
Frequency Coverage: 1.8 - 2.0, 3.2 - 4.7, 6.5 - 8.5, 13.4 - 19.6, 17.6 - 23.0. With 10 meter modification, 17.6 - 26.5, 20.6 - 31 MHz.
Drive Power: 65 to 80 watts typical for 1500 watts output.
Efficiency: 50 - 65% depending on frequency, drive level and load.
Distortion: -35 dB at 1 KW RF output level.
Harmonics: -50 dB typical.
Input and Output Impedance: 50 ohms.
CW Break-In: QSK with vacuum relay. RF sensing circuit prevents keying or un-keying if 10 mW of RF present on the RF drive line. Switching time less than 8 ms.
Tube Complement: Two Eimac® 3CX800A7 ceramic, external anode triodes in a grounded grid circuit. Plate dissipation, 1600 watts.
Plate Voltage: HI = 2400 Vdc, LO = 1800 Vdc, no load.
Cooling: Ducted forced air, vertical exhaust, using a two speed centrifugal blower.
Metering: Full time plate current. Switch selected plate voltage, grid current, forward power or reflected power. Peak power is indicated on a 10 element LED bargraph display. The first nine elements are amber—the tenth LED is red and indicates 1500 watts output.
ALC: Negative-going, adjustable threshold.
LED Status Indicators: Overdrive, Standby, Wait, Operate.
Primary Power: 220 - 250 Vac at 20 A, maximum. 117 Vac operation is possible but not recommended.
Protection: Primary line fuses, plate current fuse, ac line and high voltage interlocks.
Front Panel Controls: Power ON-OFF; Mode (STANDBY-OPERATE); plate voltage select (HI-LO); Plate TUNE; Loading; BAND Switch; METER Switch.

Size and Weight:
Amplifier: HWD 5.25″ x 15.25″ x 15″ (13.3 x 38.7 x 76.8 cm).
Power Supply: HWD 8.25″ x 13.4″ x 10.25″ (21 x 34 x 60 cm).
Amplifier: 17 lbs. (7.7 kg).
Power Supply: 45 lbs. (20.5 kg).

UPS shippable, factory packaged in three cartons; RF deck, power supply w/o power transformer, power transformer.

TITAN, HF LINEAR AMPLIFIER, Model 425E

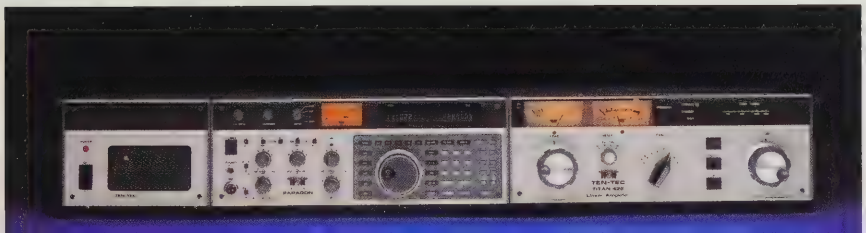
Same as Model 425 except operation is enabled to 31 MHz. This model for export only.



...America's Best!

TEN-TEC

The ultimate in linear design and performance!



MADE IN USA

Corsair II, Model 561

CORSAIR II, HF TRANSCEIVER, Model 561

The CORSAIR II is unique in all the world. This is the only full featured ham transceiver manufactured today that uses a permeability tuned oscillator. We continue to offer you this choice for a very good reason; a PTO delivers superior receiver performance. Strong adjacent signals are effectively rejected and the extremely low noise floor does not vary when strong adjacent signals are present. The ability of a PTO controlled receiver to dig out weak signals that are surrounded by "heavy hitters" is hard to beat.

Frequency tuning versatility is also unique. The main knob tunes at 18 kHz per revolution, without "incrementing." Two slower tuning rates are provided by the dual range offset control. The offset tuning is selectable to control the receiver or the transmitter, or in "transceive."

The pass band tuning in combination with 16 pole crystal ladder filtering provides enviable selectivity. Our 50 + dB notch filter virtually eliminates carrier type interference. An eight pole audio bandpass filter is also standard. Numerous features are included to delight the all-mode operator. The i-f filters are selectable independent of mode. QSK with a changeover time of 30 ms or less is great on CW and AMTOR. An electronic CW keyer with a 40 character memory is built in. A "spot" button makes it easy to "zero" a CW signal. Selectable AGC—fast, slow or off. SSB performance is enhanced with an excellent speech processor that is standard equipment as is a noise blanker with adjustable level and width controls.

All nine ham bands, from 1.8 to 30 MHz, are covered using a 12 position band switch. Each position provides 500 kHz plus 40 kHz overshoot at the band edges. Most of the MARS frequencies are included. WWV is received at 10 MHz.

The solid state, broadband "no tune" 200 watt input final amplifier (pioneered by Ten-Tec) is a solid performer, too. It will load a broader range of impedances and it does not "fold back" in key-down modes. De-rated components and excellent heat dissipation allow transmitter operation at full power, without auxiliary cooling for as much as 20 minutes, even in the "key-down" modes. The ALC control allows continuous adjustment of the output power level from 25% to 100%, independent of input drive levels. This is a great feature when driving a linear amplifier. Lower amplifier power levels may be used without re-adjusting or even connecting the amplifier derived ALC.

If your number one priority is outstanding all mode performance on the ham bands, and simplicity is still a virtue, you may be the kind of a purist who deserves a CORSAIR II.

RECEIVER SPECIFICATIONS

Sensitivity: 0.25 uV for 10 dB S/N ratio.
Selectivity: 16 pole crystal ladder filtering, 2.4 kHz bandwidth, 1.6:1 shape factor at 6/60 dB. Three position front panel switch selects standard 2.4 kHz, optional 1.8 kHz, 500 Hz or 250 Hz filters. All four may be installed with 2.4, 1.8 kHz and 500 Hz accessible in SSB mode and 1.8 kHz, 500 and 250 Hz accessible in CW mode.
Noise Floor: -129 dBm at 2.4 kHz bandwidth.
Intercept Point: + 5 dBm.
Notch Filter: Greater than 50 dB notch adjustable from 200 Hz to 3.5 kHz.
Audio Bandpass Filter: 8 pole active filter centered at 750 Hz variable from "filtered" to "flat" response.
Passband Tuning (PBT): Tunes 2nd i-f frequency ± 1.5 kHz.
Noise Blanker: Switchable on/off with adjustable level and width.
Offset Tuning: Dual range, selectable to offset RX, TX or TRX.
Antenna RX Pre-Amp: Selectable on/off.
Spot Button: To accurately "zero" a CW signal.
AGC: Selectable fast, slow and off.
I-F Frequencies: 9 and 6.3 MHz.
I-F Rejection: Greater than 60 dB.
Dynamic Range: 95 dB typical at 200 Hz bandwidth.

TRANSMITTER SPECIFICATIONS

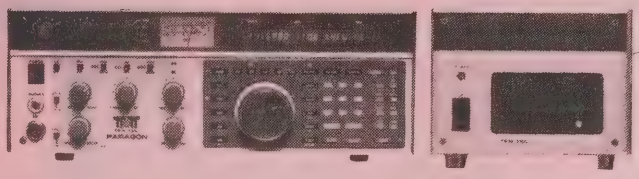
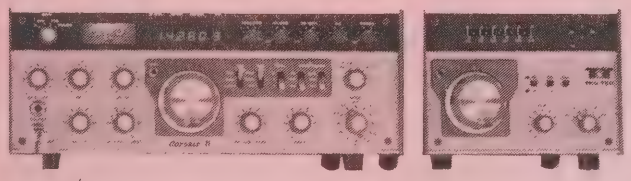
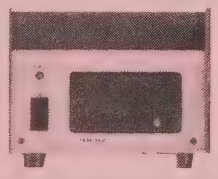
Power Output: Broadband, solid state "no tune" amplifier with 85 to 100 watts RF out on all bands. Full power TX for up to 20 minutes without auxiliary cooling.
Output Impedance: 50 ohm, unbalanced.
Iambic Keyer: Front panel speed adjustable from 8 to 50 wpm. Includes a 40 character memory, controlled from the KR1B accessory keyer.
Speech Processor: Audio type, processing level front panel adjustable.
CW Sidetone: Internally generated with adjustable tone and volume.
Full Break-In QSK: TX/RX changeover time of 30 ms or less.
ALC Control: Front panel adjustment sets RF output from 25% to 100%. Operates independently of input mic level, speech processing and CW drive. Output level remains constant until you change it.
Microphone: Low or high impedance, 5 mV output. Polarizing voltage for electrets available at mic connector.
SSB Generation: 9 MHz, 8 pole crystal ladder filter, balanced modulator. Carrier and unwanted sideband suppression, 60 dB typical.
CW Offset: 750 Hz, automatic.
Spurious Emission: Down 45 dB or better at full output.

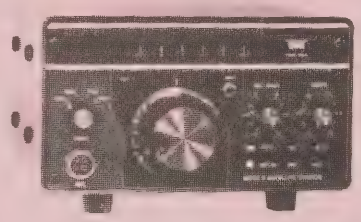
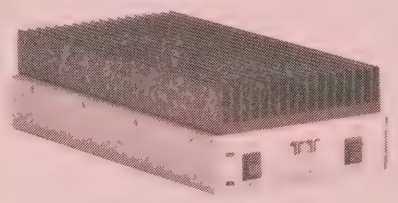
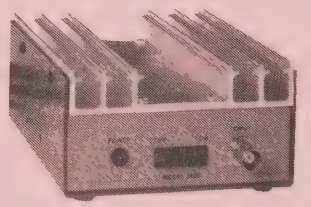
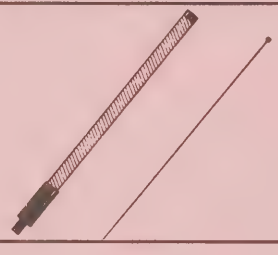
GENERAL SPECIFICATIONS

Frequency Coverage: 160, 80/75, 40, 30, 20, 17, 15, 12 and 10 meters in twelve 500 kHz segments plus 40 kHz overshoot at upper and lower band edges.
Front Panel Multimeter: Reads power amplifier collector current, forward power, SWR, speech processing level and RX S-meter.
Front Panel Connections and Controls: BP FILTER; BPT; NOTCH; AF GAIN; POWER; RF GAIN/ATTN; DRIVE; bandswitch; main tuning knob; MODE; METER switch; KEYER SPEED; N.B. LEVEL/N.B. WIDTH; ALC threshold; PROCESS level; QSK/VOX select; AGC switch; XTAL switch; OFFSET SELECT switches (2); SPOT push-button; PHONES; MIC.
Rear Panel Connections and Controls: High speed QSK output jack (open collector); EXT T/R jack (relay closure); SPARE jack (uncommitted RCA phono); AUX 12 Vdc jacks (2); KEYER MEM. jack for controlling keyer memory; standard CW KEY jack; PTT jack; VFO IN/VFO OUT; AUDIO OUT; ACCESSORIES socket; GND terminal; EXT. SPKR jack; KEYER PADDLE jack; POWER socket; SO-239 ANTENNA connector; RX-TRX switch for separate RX antenna; RX antenna RCA jack; DELAY, GAIN, ANTI-VOX controls.
Power Required: 12 - 14 Vdc, 850 mA receive, 18.5 A transmit.
Frequency Display: 6 digit (to 100 Hz) amber LED.
Frequency Stability: Less than 15 Hz change per degree F averaged over a 40 degree change from 70 to 110 degrees F after 30 minute warm up. Less than 10 Hz change from 105 Vac to 125 Vac using a Ten-Tec power supply.
Dimensions: HWD 5.25″ x 15″ x 14″ (13 x 38 x 36 cm) with bail.
Net Weight: 14 lbs. (6.4 kg).

TEN-TEC INC

HIGHWAY 411 EAST SEVIERVILLE, TENNESSEE 37862 (615) 453-7172

	MODEL	DESCRIPTION	Shp. Wt. lbs/Kg (oz/gm)	HAM NET
 MODEL 585 PARAGON MODEL 960 POWER SUPPLY	585	PARAGON General Coverage HF Transceiver, 200 W. SSB/CW/FSK,1.8-30 MHz	24/10.9	2245.00
	961	Power Supply, 115/230 VAC, 13.5 VDC, 22 A, built-in Spkr.	21/9.5	239.00
	282	250 Hz 6 Pole Ladder Filter	(3/85.)	69.00
	285	500 Hz 6 Pole Ladder Filter	(3/85.)	69.00
	288	1.8 KHz 8 Pole Ladder Filter	(3/85.)	69.00
	705	Desk Microphone, Electret, with Cord and Connector	1/0.45	69.00
	700C	Handheld Mic., Electret with Coiled Cord and Connector	1/0.45	37.00
	1140	DC Circuit Breaker, for Models 580/560/561/546/585	(3/85.)	18.00
	256	FM Transceive Module	1/0.45	65.00
	257	Voice Synthesizer	(3/85.)	89.00
	258	RS-232 Interface	(3/85.)	65.00
	258-IBM	Serial Communications Software for IBM PC/XT	(3/85.)	10.00
	258-COM	Serial Communications Software for COMMODORE 64/128	(3/85.)	10.00
	258-AII	Serial Communications Software for APPLE IIE/C	(3/85.)	10.00
	258-MAC	Serial Communications Software for APPLE MACINTOSH	(3/85.)	10.00
	259	Universal ALC Annunciator	(3/85.)	39.00
	80-572	Spare, 4 Pin DC Connector	(3/85.)	1.50
	35057	4 Pin Microphone Connector	(3/85.)	2.50
 MODEL 561 CORSAIR II MODEL 263G REMOTE VFO  MODEL 960 POWER SUPPLY	561	CORSAIR II HF Transceiver, 200 W./SSB/CW, 1.8-30 MHz	21/9.5	1445.00
	961	Power Supply, 115/230 VAC, 13.5 VDC, 22 A, built-in Spkr.	21/9.5	239.00
	263G	Remote VFO	10/4.5	269.00
	282	250 Hz 6 Pole Ladder Filter	(3/85.)	69.00
	285	500 Hz 6 Pole Ladder Filter	(3/85.)	69.00
	288	1.8 KHz 8 Pole Ladder Filter	(3/85.)	69.00
	705	Desk Microphone, Electret, with Cord and Connector	1/0.45	69.00
	700C	Handheld Mic., Electret with Coiled Cord and Connector	1/0.45	37.00
	603	KR1B, Dual Paddle Memory Key	1/0.45	69.00
	1140	DC Circuit Breaker, for Models 580/560/561/546/585	(3/85.)	18.00
	259	Universal ALC Annunciator	(3/85.)	39.00
	80-572	Spare, 4 Pin DC Connector	(3/85.)	1.50
	35057	4 Pin Microphone Connector	(3/85.)	2.50
MODEL 425 TITAN	425	TITAN Linear Amplifier, 1.5 KW output, 1.8-23 MHz, with Power Supply (UPS Shippable)	67/30.4	2685.00
	425E	TITAN Linear Amplifier, 1.5 KW output, 1.8-31 MHz, with Power Supply (For Export Only)	67/30.4	2685.00
MODEL 229B 2KW ANTENNA TUNER	229B	2 KW Antenna Tuner/SWR Bridge	13/5.9	349.00
	3229	Balun Kit	2/0.9	18.00
	209	300 Watt Dummy Load	1/0.45	29.00

	MODEL	DESCRIPTION	Shp. Wt. lbs/Kg (*oz/gm*)	HAM NET
 MODEL 2510 MODE "B" SATELLITE STATION	2510	Satellite Station, Mode B, SSB/CW	9/4.1	549.00
 MODEL 2410 70CM 100 WATT AMPLIFIER	2410	All Mode Linear Amplifier , 100 W., 430-450 MHz	6/2.7	355.00
	2410N	Model 2410 with "N" Connectors	6/2.7	365.00
 MODEL 2425 2 MTR. 30 WATT AMPLIFIER	2425	FM Class C Amplifier, 30 W., 144-148 MHz	3/1.4	87.00
 HF MOBILE ANTENNA SYSTEM	3001	Switchable Mobile Matcher for 20-80 Meter Bands	1/0.45	18.00
	3101	Replacement Top Section Stinger, 42" Long	4/1.8	7.75
	3101L	Replacement Top Section Stinger, 49" Long	4/1.8	7.75
	3110	Mobile 10 Meter Antenna 72" High	4/1.8	24.50
	3115	Mobile 15 Meter Antenna 72" High	4/1.8	25.00
	3120	Mobile 20 Meter Antenna 72" High	4/1.8	27.50
	3130	Mobile 30 Meter Antenna 72" High	4/1.8	28.50
	3140	Mobile 40 Meter Antenna 78" High	4/1.8	31.00
	3175	Mobile 75 Meter Antenna 78" High	4/1.8	34.00
	3180	Mobile 80 Meter Antenna 78" High	4/1.8	34.00
HANDHELD AIRBAND TRANSCEIVER • All 920 Channels • 10 Memories • Standard Aviation Headset Jacks • Noise Blanker • Programmable Scanning • Sidetone Monitor MODEL TT920 AIRBAND TRANSCEIVER	TT-920	Airband Transceiver / 115 V Charger	3/1.4	395.00
	TT-920	Airband Transceiver / 220 V Charger	3/1.4	415.00
		ACCESSORIES FOR TT920 AND 2591		
	2207	Simulated Leather Case, for Model TT920	1/0.45	15.00
	2990	Universal Battery Case (Alkaline, etc.)	1/0.45	29.00
	2991	Extra 450 mAH Battery Pack, for Model TT920	1/0.45	43.00
	2992	Drop-In 5 Hour Desk Charger / 115 V, for Model TT920	1/0.45	87.00
	2992/E	Drop-In 5 Hour Desk Charger / 220 V, for Model TT920	1/0.45	87.00
	2993	12 VDC Adapter Pack, for Model TT920	1/0.45	27.50
	2994	Extra 14 Hour Wall Charger / 115 V	1/0.45	15.00
	2994/E	Extra 14 Hour Wall Charger / 220 V	1/0.45	30.00
	3300	Extra Rubber Antenna	1/0.45	12.00
	3301	Extendible Whip Antenna	1/0.45	15.00
	50019	Extra Steel Belt Clip	1/0.45	5.00

This price list is effective June 01, 1988.

TEN-TEC Warranty and Product Support

In 1968 Ten-Tec was founded by Albert Kahn, K4FW, and Jack Burchfield, K4JU. From the beginning, product support and customer service have been basic. Our philosophy is that a sale is the beginning of a friendship and that it is our obligation to provide fast and economical service if ever needed. The application of the principal of the "Golden Rule" and caring for our customers has contributed greatly to our success.

Our term of warranty is one year. We promise you fast, thorough service, and if out of warranty, at a fair and honest cost. We strive to have all Ten-Tec owners happy ones.

Accessories for Paragon and Corsair II

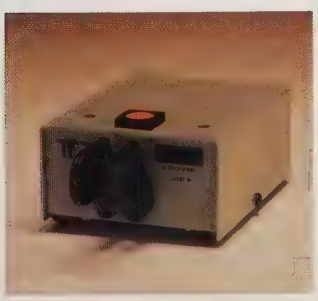
REMOTE VFO, Model 263

This little beauty adds a whole lot of versatility to the CORSAIR II system. It uses the same type PTO as the CORSAIR II and can control transmit, receive or transceive frequency. You can also listen to both transmit and receive frequencies simultaneously! A balance control is provided for "priority" adjustment—a great feature in a DX pile-up! A momentary "reverse" button is provided to check your transmit frequency in any PTO configuration. Four crystal sockets are built-in and are front panel selectable; a nice touch if you are a net operator. Crystal controlled operation is possible on any of these bands: 160M 1.7 to 2.1 MHz, 80M 3.4 to 4.2 MHz, 40M 6.9 to 7.4 MHz, 30M 10.01 to 10.6 MHz, 20M 13.8 to 14.6 MHz, 17M 18.05 to 18.6 MHz, 15M 20.8 to 21.65 MHz, 12M 24.5 to 21.65 MHz, 10M 27.8 to 30.0 MHz.

The 263 connects directly to the CORSAIR II using the prefabricated cables provided.
Size: HWD 5.25″ x 7.5″ x 12″. (13.3 x 19 x 30.5 cm).
Weight: 4 lbs. (1.8 kg).

SPEAKER/POWER SUPPLY, Model 960

Designed for use with either the CORSAIR II or the PARAGON. This highly regulated and very well filtered power supply uses 109 to 125 or 218 to 250 Vac 50/60 Hz, primary power, fuse protected. The output voltage is adjustable from 11.5 to 15 Vdc, factory adjusted to 13.8 Vdc and "over-voltage" protection is incorporated. Regulation is better than 1%, from "no load" to "full load." A re-setting, electronic latching circuit breaker limits current for the protection of the radio and is adjustable. Maximum load is 25 A. Ripple is less than 60 mV peak-to-peak at 25 A, 117 Vac. The front panel mounted speaker is a ceramic magnet dynamic, 8 ohm. The output cable is terminated into a 4 pin AMP MATE-N-LOC® which connects to the CORSAIR II or PARAGON. Two rear panel phono jacks may be used to supply dc to low power accessories.
Size: HWD 5.25″ x 7.5″ x 13.5″. (13.3 x 19 x 34.3 cm).
Weight: 18 lbs. (8.2 kg).



DUAL PADDLE MEMORY KEY, CORSAIR II, Model KR1B/603

This lambic paddle is designed to operate the keyer system built into the CORSAIR II, including operation of the 40 character memory. Paddle "travel" is adjustable. Paddle "tension" is adjustable using a magnetic system controlled with a single rotary knob. Keyer is powered from an Auxiliary dc jack on the rear panel of the CORSAIR II.

MICROPHONES FOR 525 (D), 546, 580

700A Hand mic, electret w/coiled cord and phone plug
705A Desk mic, electret with cord and phone plug

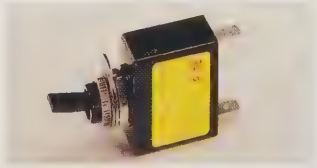
MICROPHONES FOR 560, 561, 585

700 C Hand mic, electret w/coiled cord and connector
705 Desk mic, electret with cord and connector

HF ACCESSORY FILTERS

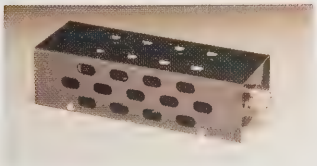
For 560, 561, 580, 585 Transceivers
282 250 Hz 6 pole ladder filter
285 500 Hz 6 pole ladder filter
288 1.8 KHz 8 pole ladder filter

For 546/525(D)
217 500 Hz 8 pole ladder filter
218 1.8 kHz 8 pole ladder filter
219 250 Hz 6 pole ladder filter
220 2.4 kHz 8 pole ladder filter



CIRCUIT BREAKER

1140 DC Models 546/560/561/580/585



DUMMY LOAD

209 1.8 to 30. MHz, 300 watts

KW Antenna Tuner, Model 229B

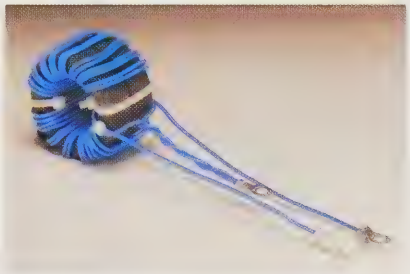
KW ANTENNA TUNER, Model 229B

This tuner adds a lot of versatility to your station. For example, it solves the problem of operating an 80 meter dipole on 75 meters and still presenting your transmitter with an acceptable load impedance. Or if you want to explore the WARC bands and you haven't gotten around to installing resonant antennas for those bands, no problem. The 229B will load virtually any unbalanced load (coaxial or single wire) and do so at all the power the law allows from 1.8 through 30 MHz. The modified "L" network will tame an SWR of at least 10:1, any phase angle, without "false load" problems.

With the accessory balun, (installs easily inside the 229B cabinet) the same capability is available using balanced feedline antennas. Front panel switching selects any one of four antennas, one of which may use a balanced feedline, or you can by-pass the tuner. The meter circuit measures forward power in 2 ranges, 0-200 or 0-2 KW, and reflected power. A great way to operate all bands with something less than a "world class" antenna farm.

SPECIFICATIONS

Circuit: Modified "L" network.
RF Power: 2 KW.
Frequency Range: 1.8 to 30 MHz.
Output Matching Range: At least 10:1 SWR, any phase angle, 1.8 to 30 MHz. Maximum impedance at full power, 3000 ohms. Maximum impedance, balanced load using accessory balun, 500 ohms.



Input Impedance: 50 ohms, SO-239 connector.
Capacitor Voltage Rating: 3.5 kV.
Inductance: 28 uH silver plated roller inductor.
Size: HWD 5.5″ x 13″ x 11″ (13.9 x 33 x 27.9 cm).
Weight: 9 lbs. (4.1 kg).

ROLLER INDUCTOR and high power variable capacitor, used in the 229B are available separately. Contact our Service Department for details.

BALUN ACCESSORY for 229B
Model 3229

Get superb performance from your equipment with the KW antenna tuner!

The Ultimate, HF Mobile Antenna System

HF mobile operation is a world of compromise. Give yourself a break and start with a good antenna system. The ULTIMATE series provides the best compromise between radiation efficiency and mechanical "reality!" The lower section is a fiberglass enclosed loading coil. The upper "stinger" is a top quality, stainless steel, taper ground whip. It is vertically adjustable for "no tears" tuning. The overall height allows use without a spring and clears most overhead obstacles. The overall profile provides the lowest wind resistance and as a result, less tilting and de-tuning. The entire assembly is environmentally protected for years of trouble free service. Use any mount with 3/8″ x 24 fitting.

MODEL 3110, 10 Meter Antenna, 72″

MODEL 3115, 15 Meter Antenna, 72″

MODEL 3120, 20 Meter Antenna, 72″

MODEL 3130, 30 Meter Antenna, 72″

MODEL 3140, 40 Meter Antenna, 78″

MODEL 3175, 75 Meter Antenna, 78″

MODEL 3180, 80 Meter Antenna, 78″

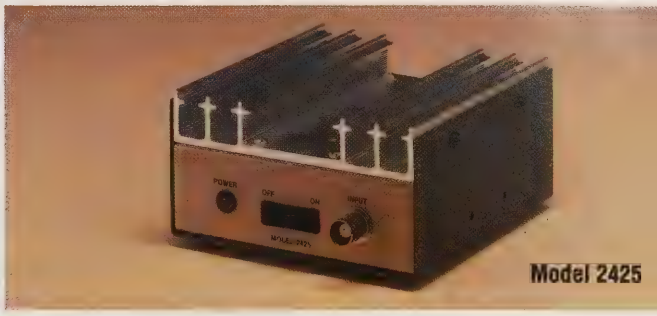
MODEL 3101, Replacement Stinger 42″

MODEL 3001, 20 - 80 Mobile Matcher

MODEL 3001

Mode B, Satellite Station Model 2510

Model 2410



Model 2425

SATELLITE STATION, MODE B, Model 2510

If you have a heavy duty investment in a good HF station, the 2510 makes good sense. The 2510 is a 10 watt, all mode, 70 cm transmitter with an excellent 2 meter receiver/converter. The receiver output is converted to 29 MHz. As with any amateur radio pursuit, the key to success is receive capability and with the 2510 you use all of the excellent filtering and selectivity that you already have in your HF receiver.

Frequency tuning is accomplished with the VFO in the 2510. The transmitter frequency tracks the receiver tuning so that pseudo transceive operation is possible. Provisions are also made for ''split'' operation for optimum flexibility. Superb performance and compact size make the 2510 a great choice for the operator who also works the HF bands.

TRANSMITTER

Frequency Range: 435.0 to 435.5, extendable to 437.0 MHz with optional oscillator assembly.
Output Power: Adjustable to 10 watts maximum.
Output Impedance: 50 ohms, unbalanced.
Modes: USB, LSB, CW. AFSK derived digital modes.
Sideband Generation: Balanced modulator through 4 pole monolithic filter.
Transmitter Switching: PTT through mic connector.
Carrier Suppression: 50 dB minimum.
Unwanted Sideband Suppression: 30 dB minimum at 1 kHz.
Spurious and Harmonic Output: Better than 50 dB below full power rating.
Microphone Input: Low or high impedance with 5 mV output. Polarizing voltage for electret mic available at connector.

RECEIVER

Frequency Range: 145.5 to 146.0 MHz. Converted to 29 MHz output.
Conversion Gain: 25 dB typical.
Image Rejection: Greater than 60 dB.
Noise Figure: Less than 2.5 dB. GaAsFet conversion.
Dynamic Range: 85 dB typical.

GENERAL

Power Requirement: 12 to 14 Vdc, 3 A maximum.
Size: HWD 4.5″ x 7.6″ x 11″ (11.4 x 19 x 27.9 cm).
Weight: 6 lbs. (2.7 kg).

Linear Amplifier, 70 cm

LINEAR AMPLIFIER, 70 cm, ALL MODE, Model 2410

With type ''N'' connectors, Model 2410N

The 2410 is a 10 dB gain solid state, no-tune amplifier for operation from 430 to 450 MHz. 100 watts output with 10 watts drive. TX/STDBY switching can be controlled remotely with hard switching or will key automatically when 300 mW RF is sensed at the input circuit. The stripline design uses a high quality Teflon® circuit board and de-rated components throughout. Primary power is 12 to 14 Vdc at 20 A. Ideal for mobile, portable or base station use. A perfect companion for the 2510 Satellite station.

SPECIFICATIONS

Frequency Range: 430 to 450 MHz.
Output Power: 100 watts output with 10 watts drive.
Input Power: 15 watts maximum. RF sensing circuit keys amplifier at 300 mW.
Modes: SSB, CW, FM, RTTY.
DC Power: 12 to 14 Vdc at 20 A, typical.
Input/Output Impedance: 50 ohms, unbalanced.
Duty Cycle: Intermittent, typical amateur service.
Protection: Reverse voltage; over temperature kicks out at 170 degrees F, resets at 140 degrees F; internal 35 A fuse in dc line.
Delay: T/R delay adjustable in SSB mode.
RF Connectors: Model 2410, SO-239. Model 2410N, type ''N''.
Size: HWD 3.25″ x 5.7″ x 11.25″ (8.3 x 15 x 29 cm).
Weight: 4 lbs., 14 oz. (2.2 kg).

2 Meter Amplifier, Model 2425

2 METER AMPLIFIER, 30 WATT, Model 2425

The model 2425 is a high quality, compact amplifier designed to be used with a hand-held transceiver. One to three watts of drive is amplified to thirty watts output. The amplifier is carrier operated and is ideally suited for mobile, portable or base station use.

SPECIFICATIONS

Frequency Range: 144 to 148 MHz.
Mode: Class C, FM or CW.
Input Power: 1 to 3 watts.
Output Power: 25 to 30 watts.
Harmonic Output: More than 60 dB below carrier.
Primary Power: 12 to 14 Vdc. 13.8 Vdc (negative ground) 5 A.
Impedance: 50 ohms input and output, unbalanced.
Switching: Carrier operated relay.
Size: HWD 2.25″ x 4.12″ x 5″ (5.7 x 10.5 x 12.7 cm).
Weight: 1 lb. (.45 kg).

...America's Best!

TEN-TEC

MADE IN USA

The Ten-Tec Story

All Ten-Tec products are produced in our 40,000 square foot plant located in the foothills of the Great Smoky Mountains. The basic processes are done in-house including the design and manufacture of printed circuit boards, plastic molding, sheet metal fabrication and finishing, and of course electronic assembly and testing. We produce our own tooling in our well equipped tool and die shop. Our development lab and quality control department are exceptionally well staffed and supported by the latest in instrumentation.

We produce custom enclosures for other equipment manufacturers and a standard catalog line of metal enclosures. We produce custom tools and dies for many manufacturers in the region. This unique combination of in-house processes ensures our ability to produce equipment of the highest quality, reliability and value.

We are proud of our reputation for customer service and product support. Our philosophy is that a sale is the beginning of a happy relationship. We provide service on our products that have been discontinued for many years, and we do so promptly and at an honest charge. Ten-Tec solves communications problems. If you have a special need, try us. We may have a cost effective solution. Your inquiry will be most welcome.

Ten-Tec manufactures communications electronics for non-amateur radio applications too. Some are custom designs for special applications and some are treated as catalog products. A few examples of "catalog" products are:

AVIATION HAND-HELD TRANSCEIVER, Model TT-920.

The TT-920 is a fully synthesized, full featured, AM transceiver that operates in the aviation COM/NAV band of 108. to 136. MHz. All 720 COM channels and 200 NAV channels are included. In addition, the transmit and receive frequencies can be "split" which allows air/ground communications through the 200 NAV channels. Ten programmable memories and instant recall of the emergency channel. Memory scan and band scan are programmable. The TT-920 is the most compact hand-held transceiver available that accepts standard aviation microphone and headphone plugs. A full line of accessories is available.

HF-SSB TRANSCEIVER, Model 150 Series.

This is a 100 watt PEP transceiver that operates in the 2 to 12 MHz range. "No-tune" solid state design is ideal for non-technical operators. Primary power is 12/14 Vdc. Ideal for mobile or base operation. Excellent receive and transmit performance, channelized for simplicity, highly reliable, compact and weighs only 10 lbs.

HF-SSB MANPACK TRANSCEIVER, Model 120 Series.

The 120 Series is available in three models that operate in the 3 to 5 MHz, 5 to 8 MHz or 8 to 12 MHz bands, 20 watts PEP. The unit is powered by a self-contained re-chargeable ni-cad battery. Completely portable, small, lightweight (10 lbs. including battery pack), all solid state, built-in antenna and channelized to customer specifications.

TEN-TEC
Highway 411 East
Sevierville, TN 37862, U.S.A.
(615) 453-7172

TEN-TEC

The ARGONAUT II Model 535

The Argonaut II adds a new dimension to QRP transceiver operation—world class receiver performance! The fully synthesized PLL design provides general coverage from 100 kHz to 30 MHz. Our unique new Jones I-F filter system (patent pending) is standard equipment. This is an eight pole crystal ladder filter design with a continuously variable band-width, from 500 Hz to 2.4 kHz. Outstanding selectivity that is operator optimized for ssb, cw or the digital modes. Passband tuning is digitally controlled, variable ±–2.5 kHz. Standard filters for AM or FM reception are mode selected. The Argonaut II delivers outstanding receiver performance, in the ham bands or anywhere in between.

The transmitter power is continuously variable from one-half watt to 5 watts output. Accessory attenuator provides accurate output power control to a fraction of one watt. Superb ssb performance with front panel adjustment of the "set and forget" VOX gain, delay and anti-VOX controls using our new "soft touch" control system. Noise blanker, speech processor and the FM transceive mode are all standard equipment.

QSK cw performance and a keyed wave form that will embarrass some big rigs (not ours) costing several times as much. Independent, ±–1.27 kHz, offset tuning that tracks when using the main frequency tuning control. Cw sidetone with variable pitch and volume. A reference tone can be keyed for "zeroing" a cw signal exactly.

Dual VFO's with A = B, A/B and SPLIT. In SPLIT, use the momentary REVerse button to listen to the transmit VFO to "pick and set" your transmit frequency. This feature allows strategic positioning in a pile-up. Frequency is entered with the numeric key pad or tuned with UP/DOWN buttons in 100 kHz or 1 MHz steps. Use the FUNCTION-UP/DOWN buttons to scroll through the ham bands.

Other features include variable tuning rates from 10 Hz to 500 Hz, selected with FAST/SLOW button and/or mode. Thirty-one memories. Ten of the memories can be programmed for split frequencies. Scratch pad for temporary storage of frequency and mode, with single button recall. Memory recall by channel number or using memory tune.

The Argonaut II is designed for base station, mobile or portable use. Energy efficient for practical battery operation. Operates on 12/14 Vdc or 12/14 Vac using a wall transformer. The LCD display panel shows frequency, VFO status, mode, memory channel, 24 hour clock and multi-function bar-graph meter. Back lighting is provided with an electro-luminescent panel which may be turned on/off.

The Argonaut II is the result of research within the QRP community. Many of the features are the direct result of feedback from the QRP "Gurus," worldwide. All of the transceiver features are standard equipment. We are proud of our QRP heritage and we think this pride shows in the Argonaut II.

GENERAL SPECIFICATIONS

Frequency Coverage: Transmit all ham bands, 160 through 10 meters. Receive 100 kHz to 29.999.99 MHz.
Frequency Control and Read-Out: Microprocessor controlled, digital phase locked loop synthesizer. 10 Hz resolution.
Frequency Accuracy: ±–100 Hz @ 25 degrees C.
Dual VFO Control System: A/B selects A or B VFO. A = B nets both VFOs to mode and frequency. SPLIT allows independent transmit/receive frequency control. REVerse momentarily switches to opposite VFO to listen to or set transmit frequency when operating SPLIT. Can operate cross band and mode.
VFO Tuning Rates: 10 Hz or 50 Hz selectable with FAST button in ssb or cw. 100 Hz or 500 Hz in FM or AM (receive only) modes.
Memory System: Non-volatile RAM. 31 total. 10 may be programmed for split frequency combinations. Store by channel number or random to an available channel. Recall by channel number or select using memory tune function.
Frequency Stability: Worse case, 1 PPM per degree C @ 25 degrees C.
Display: Liquid crystal. Electro-luminescent back lighted panel with on/off switch.
Primary Power: 12/14 Vdc or Vac. Filter, rectifier and current regulator, built-in. Can be operated with a 12/14 Vac transformer.
Antenna Impedance: 50 Ohms, unbalanced.
Printed Circuit Boards: G-10 epoxy glass.
Dimensions: HWD 3.75" x 9.75" x 12.5" overall. (9.5 x 24.8 x 31.7 cm).
Net Weight: 8 lbs, 10 oz. (3.91 kg).

TRANSMITTER

Modes: LSB, USB, CW, FM. Digital modes using externally generated AFSK. AM transmit not provided.
RF Output: Continuously variable, using front panel control, from 5 watts to approximately .5 watt.
Microphone Input: 250 to 50,000 Ohms, dc bias voltage for electret element provided.
CW Sidetone: Internally generated, adjustable volume independent of receiver volume control. Tone frequency internally adjustable.
SSB Generation: Double sideband modulator. 8 pole crystal ladder filter.
Carrier Suppression: Greater than 60 dB.
Unwanted Sideband Suppression: Greater than 50 dB @ 1.5 kHz AF input.
Harmonic Emissions: Greater than 45 dB below peak power output.
Spurious Output: Greater than 50 dB below peak power output.
Third Order Intermod Products: –30 dB from two tone at 5 watts output.
Metering: Forward power, SWR in transmit. S-meter in receive. In the "soft touch" adjust mode, the meter scale is used to display VOX gain, anti-VOX and other control settings.
CW Offset: Factory preset 500 Hz, field programmable.
VOX System: VOX gain, delay and anti-VOX are front panel adjustable using our "soft touch" control system.

RECEIVER

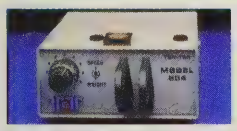
Modes: USB, LSB, CW, FM, AM and digital modes.
Sensitivity:

Mode	.1 to 1.6 MHz	1.6 to 29.999.99 MHz
SSB/CW/AFSK	.5 uV	.25 uV
AM	3.5 uV	1.00 uV
FM	1.0 uV	.30 uV

Selectivity: 8 pole, crystal ladder I-F filter with continuously variable band-width, from 500 Hz to 2.4 kHz, used in cw and ssb (also digital) modes. FM and AM modes automatically select built-in fixed band-width filters.
Attenuator: –20 dB, .1 to 29.999 MHz.
I-F Frequencies: 1st = 45 MHz, 2nd = 6.144 MHz. (FM mode 3rd = 455 kHz).
Image Rejection: Greater than 80 dB.
I-F Rejection: Greater than 70 dB.
Noise Blanker: Switchable, ON/OFF.
Dynamic Range: 95 dB, typical.
Noise Floor: –129 dBm. (.25 uV for + 10 dB s/n in ssb)
Squelch Sensitivity: Less than .6 uV.
Receiver Recovery Time: Less than 27 ms.
Receiver Offset w/RXO Control: ±–1.27 kHz with digital display.
Passband Tuning: Digitally controlled, ±–2.5 kHz.
BFO: Digitally controlled, phase locked loop.
Audio Output: 1.5 watts @ 8 Ohms, less than 2% THD.
Notch Filter: .250 to 2.2 kHz, greater than 50 dB notch depth.

Specifications subject to change.

AVAILABLE OCTOBER 1990



Model 604 Electronic Iambic Keyer.
Unique torque driven paddles and adjustable magnetic tensioning system for the ultimate "touch" control. Front panel adjustment of speed and weighting. A cw operator's delight.

Model 605 Single Paddle Electronic Keyer.
Operation is just like a "bug" except the dashes are also keyed automatically. Adjustable paddle tension, speed and weighting. Also great for mobile use.

Model 606.
Single paddle electronic keyer designed for battery power, using a Curtis chip. Adjustable paddle travel and tension. Speed and weighting front panel adjustable. Small size, energy efficiency and rugged paddle construction make this model the ideal traveller.

MICROPHONES FOR USE WITH ANY MODEL WITH A 4-PIN MIC CONNECTOR
700C Hand mic, electret w/coiled cord and connector.
705 Desk mic, electret with cord and connector.

The HERCULES II, Solid State Kw Linear Amplifier Model 420

High tech simplicity, base or mobile. A compact, lightweight HF amplifier that offers a unique combination of virtues that can only be achieved using modern, solid state technology. Instant on, 12 - 14 Vdc operation, general coverage from 160 through 10 meters, no-tune operation and compact size. Add to that, lightning fast QSK cw, remote control, superb linearity and a low drive requirement. Outstanding!

The Hercules II is attractively styled to match our HF base station transceivers and will interface nicely with virtually all transceivers. The front panel includes an analog multi-meter for collector current, voltage, forward power and SWR. A ten element LED bargraph instantaneously displays peak power output. Band selection is either with the front panel switch or remotely via a rear panel connector. A front panel speaker is built in.

The internal heat sinks are air cooled by a temperature controlled tube axial fan. Whisper quiet in ssb operation, yet enough air capacity for cool operation in the key-down modes. The Hercules II is compact, good looking and generates a signal that is within one S-unit of the mighty Titan.

MODEL 9420 115/230 VAC POWER SUPPLY

Housed in a separate utility enclosure and remotely controlled through the 6 foot power cable. 100 amperes at 13.7 Vdc is provided. 80 amperes for the amplifier and 20 amps for the exciter. An alternate power supply can be a heavy duty, deep cycle, lead acid battery and an automatic 10 amp charger. This low cost alternative power source will support the Hercules II during sustained amateur service.

EXTENSION CABLE FOR REMOTE CONTROL, MODEL 300.

Twelve foot extension cable for use with the Model 9423 remote control. Terminated at both ends for quick installation.

REMOTE CONTROL HEAD MODEL 9423.

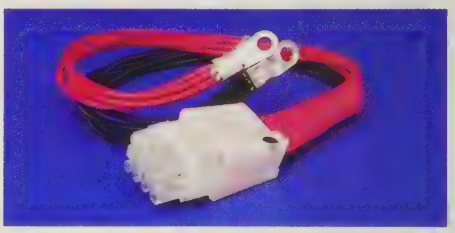
For mobile installations with the Hercules II remotely mounted. Compact size (HWD 1.5″ x 6.25″ x 4″) allows the remote head to be installed at the transceiver. Functions include ON/OFF, QSK or VOX/PTT control, band select with band indicator LEDs, 10 element LED peak power display and ''FAULT'' indicator. Unit includes mounting bracket and 12 ft. cable, terminated to plug into the Hercules II rear panel remote control connector. For longer cable runs, order Model 300, 12 ft. extension cable.

MODEL 264.

A combination ''Y'' (Molex connectors) and 4 ft. extension cable for adding a second device to the automatic band select information line. This cable required, in addition to the Model 236, if both the Hercules II and Model 253 automatic tuner are used.

MODEL 9422 DC CABLE.

Model 9422 DC power adaptor cable for mobile or fixed station battery power. 14″ length with 12 pin Molex that connects to the amplifier and heavy terminal lugs for positive and negative battery connection.



MODEL 236.

A combination ''Y'' (25 pin ''D'' connectors) and 4 ft. extension cable for connecting the Hercules II for remote control from a Paragon or Omni V transceiver. Provides a second 25 pin ''D'' connector for connection of second device such as a computer or the Model 301 remote frequency tuning encoder (Omni V only) to the transceiver.

Titan, HF Linear Amplifier, Model 425

The Tital has it all! Maximum legal power with ease, all full power bands 160 through 15 meters (10 and 12 meters after authorized modification), lightning fast QSK for break-in cw and the digital modes and a two speed blower for quiet operation. This awesome performance from a desk top amplifier is made possible by the remote power supply and a pair of Eimac® 3CX800A7 ceramic triodes. The heart of the power supply is our own four core, tape wound Hypersil® transformer. This 41 lb behemoth is conservatively rated at 2.5 kVa CCS (9.2 kVa IVS) and is nearly noiseless, even at 1500 watts output!

Other features include a front panel, peak reading wattmeter using an instantaneous ten element LED bargraph display. PTT/VOX or QSK control line select switch, built-in SWR meter and an ''over-drive'' warning LED. 3:1 vernier TUNE and LOAD controls in combination with an outstanding RF deck design, make the Titan a real ''pussy cat'' to load and operate.

The Titan is styled to match our transceivers but it interfaces beautifully, no matter what exciter you are using. If you are ready to choose your dream amplifier, the Titan has it all! Check it out.

TEN-TEC

The CENTURION, HF Linear Amplifier Model 422

The Model 422 Centurion uses the classic pair of Eimac® 3-500Z tubes. The RF deck and power supply are combined into a single, attractively styled, desk top cabinet. The power output is rated at 1300 watts on ssb, 1000 watts cw and 650 watts using "key-down" modes. Drive required for full power ssb operation is 100 watts. The duty cycle is 50%.

QSK cw is achieved using relay switching and the proven T/R circuit from the Hercules II. This circuit also makes the Centurion ideal for fast switching digital modes. VOX ssb is silky smooth and virtually noiseless. This versatile control system assures compatibility with all exciters with amplifier control provisions.

A tube-axial fan is used for forced air cooling. Air flow is routed through the power supply as well as the upper and lower sections of the RF compartment. Air inlets and outlets are in the sides and top of the cabinet to optimize low pressure, low noise, air movement.

A dedicated meter for plate current, a multi-meter for plate voltage, grid current and forward or reflected power. A full time 10 element LED bargraph instantly displays peak power output.

The Centurion operates on all bands from 1.8 to 21.5 MHz. 21.5 to 29.7 MHz is enabled with the installation of an expansion board, supplied no-charge upon proof of licensed authority.

A tough, easy to handle, amplifier that doesn't really mind a little abuse. The Centurion is a great value.

SPECIFICATIONS

Band Coverage: 1.8-2.0, 3.2-4.7, 6.5-10.3, 13.4-19.6, 17.6-21.5 MHz. 21.5-29.7 MHz after authorized modification.
Input Power: 2000 watts, maximum.
Power Output: 1300 watts ssb, 1000 watts cw. RTTY and SSTV 650 watts, 50% duty cycle.
Drive Power: 100 watts for full rated output.
Efficiency: 50-65%, depending on frequency and load impedance.
Input/Output Impedances: 50 Ohms, unbalanced. SWR ◄2:1.
Distortion: –35 dB from 1 kw rf output level.
Harmonics: –50 dB typical.
CW Break-In: QSK capable. Relay switching.
Tube Compliment: Two Eimac® 3-500Z.
Power Amplifier Circuit: Class AB2, grounded grid.
Plate Voltage: 3100 volts, no load. 2600 volts, full load.
Cooling: Forced air with full chassis air flow.
Metering: Dedicated plate current meter. Selectable multi-meter for plate voltage, grid current, forward or reflected power. Ten element LED bargraph display for peak power indication.
Front Panel Status Indicators: Standby, operate, transmit.
Primary Power: 220-250 Vac @ 15 A. 110-125 Vac @ 30 A, 50/60 Hz. For full power operation, 220-250 Vac is strongly recommended.
Circuit Protection: Primary line fuses. Plate transformer primary interlock and high voltage shorting bar.
Front Panel Controls: Power on/off, standby/operate, control mode select (QSK - PTT/VOX), plate TUNE and LOAD, band switch, meter switch.
Tune and Load Controls: 6:1 vernier drives with calibrated dial skirts.
Construction: Aluminum chassis, front and rear panels, interior partitions and top and bottom covers.
Size: HWS 8.25″ x 15.25″ x 18.5″. (20.3 x 38.7 x 46.9 cm).
Weight: 47 lbs (21.3 kg).

OUR BEST FEATURE

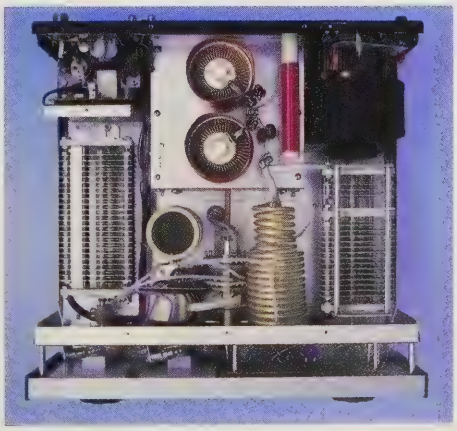
is one you may never use. Our service and product support are legendary. Proven, not just claimed! All of our products are designed for field service to the board level. When you call us with a service need, you typically talk to one of the techs who services the model you own. Many times service can be accomplished with a "pain-less" mail order board exchange. If factory service is required, the work is thorough, fast and at a fair charge.

SPECIFICATIONS

Frequency Coverage: 1.8-2.0, 3.2-4.7, 6.5-8.5, 13.4-19.6, 17.6-23.0. With 10 meter modification, 17.6-26.5, 20.6-31 MHz.
Drive Power: 65 to 80 watts typical for 1500 watts output.
Efficiency: 50-65% depending on frequency, drive level and load.
Distortion: –35 dB from 1 KW RF output level.
Harmonics: –50 dB typical.
Input and Output Impedance: 50 Ohms.
Transmit/Receive Control: Provision for PTT or QSK control lines, front panel selectable. T/R switching uses a Jennings® vacuum relay. RF sensing circuit prevents keying or un-keying if 10 mW of RF present on the RF drive line. Switching time less than 8 ms.
Tube Complement: Two Eimac® 3CX800A7 ceramic, external anode triodes in a grounded grid circuit. Total plate dissipation, 1600 watts.
Plate Voltage: 2400 Vdc, no load.
Over-Drive Protection: A front panel warning light turns on when grid current reaches the allowable limit. At the same time, the grid current limiting circuit takes over to protect the PA tubes.
Cooling: Ducted forced air, vertical exhaust, using a two speed centrifugal blower.
Metering: Full time plate current. Switch selected plate voltage, grid current, forward power or reflected power. Peak power is indicated on a 10 element LED bargraph display. The first nine elements are green—the tenth LED is red and indicates 1500 watts output.
ALC: Negative-going, adjustable threshold.
LED Status Indicators: Overdrive, Standby, Wait, Operate.
Primary Power: 220-250 Vac at 20 A, maximum. 117 Vac operation is possible but not recommended.
Protection: Primary line fuses, plate current fuse, ac line and high voltage interlocks.
Front Panel Controls: Power ON-OFF, STANDBY-OPERATE, selectable control lines VOX/PTT or QSK, Plate TUNE and LOAD controls, BAND Switch, METER Switch.
Size: RF deck, HWD 5.25″ x 15.25″ x 15″. (13.3 x 38.7 x 76.8 cm). Power supply, HWD 8.25″ x 13.4″ x 10.25″. (21 x 34 x 60 cm).
Weight: RF deck, 17 lbs, (7.7 kg). Power supply, 50 lbs, (20.5 kg).

UPS shippable, factory packaged in three cartons; RF deck, power supply w/o power transformer, power transformer.

The Titan is backed by a 3-year limited warranty.



RF Deck

Two Kw, Automatic HF Antenna Coupler Model 253

The ultimate convenience for the station that does not have a world class antenna system, or for the all mode operator who doesn't have the antenna bandwidth required to cover the bands from top to bottom. All you do is provide the Model 253 with 50 watts of tune signal, press the TUNE button, and within seconds your antenna is matched to the transmitter and ready for full power operation. Pretty neat, eh!

The Model 253 also functions as a desk top antenna management system. Provision is made to connect four separate antennas which are selectable from the front panel of the coupler. The fourth antenna position can be configured for a long-wire, balanced feeders using the built-in hi-power balun, or another coaxially fed antenna.

The same silver plated high power roller inductor used in our reliable, time proven, manual tuners is incorporated into the 253. The inductor is driven by a 12 vdc stepping motor. Fixed capacitor values are quickly evaluated and selected with long life, enclosed, relays. Two high speed, high voltage and low loss, vacuum relays are used to switch the tuner into and out of the circuit.

The tuning routine is controlled by an on-board computer. A memory is provided for each of the four antenna positions that recalls the computer derived settings last used with that antenna switch position. If band switching information is provided by the transceiver, (like the Ten-Tec Paragon, with the optional RS-232 board, and Omni V) one memory is available for each of seven bands at each antenna switch position. If the Ten-Tec Hercules II amplifier is used, the entire station is automatically controlled by the Ten-Tec transceiver. When the memories are used, tune-up is almost instantaneous. Front panel switches are provided for manual over-ride of the automatic system, in case you think you are "smarter" than the on-board computer.

The Model 253 is performance competitive with commercial and military antenna couplers costing many times more. We think that this new product is an example of American ingenuity at its best.

SPECIFICATIONS

Circuit Type: Reversible "L" network.
RF Power Rating: 2 KW maximum.
Frequency Range: 1.8 to 30 MHz.
Input Impedance: 50 Ohms, nominal.
DC Power Input: 12-14 volts, 2 amps maximum.
Size: HWD 5.5 x 14 x 10.5" (138 x 356 x 267mm).
Weight: 9 lbs 9 oz (4.34 Kg).

Tuning Accuracy: 1.5:1 VSWR maximum after tuning, 2.5:1 VSWR maximum during tuning.
Automatic Tuning Time: 5 seconds typical, 30 seconds maximum (from home position).
Manual Tuning: Full range manual tuning available via front panel up/down switches.
Memory Tuning: Tuner automatically returns to settings last used for each antenna switch position. Separate settings are stored for each band if remote band connector is used. Retuning (auto or manual) updates memory.
Tune Power: 50 Watts minimum, 150 Watts maximum. Radiated power at least 6dB below input during tuning.
Antenna Switch: 4 position. Position 4 configurable for coax, single wire, or balanced line feed. Internal balun standard.
Output Matching Range: At least 10:1 VSWR, any phase angle, 1.8 to 30 MHz. 1300 Ohms maximum parallel equivalent resistance at 1500 Watts output (2 KV peak, ►26:1 VSWR). 5000 Ohms maximum parallel equivalent resistance across balanced line at 1500 Watts output (4 KV peak).
Minimum Full Power Longwire Length: Single wire feed: 180/F (MHz) feet at 1500 watts out.
Arcing Protection: "ARC" indicator illuminates when RF voltage exceeds 2 KV. Tuner is reset to bypass mode if arc indication remains for 1 second.

ANTENNA TUNER, MODEL 254 RATED AT 200 WATTS

The Model 254 antenna tuner is a compact, lightweight design that will match a variety of balanced or unbalanced antenna feedlines to the 50 Ohm output of an HF transceiver. A unique, Ten-Tec designed, tapped inductor is wound on a 2 inch diameter powdered iron core with provisions for 47 positions on the inductor selection control. Two open air variable capacitors match the input and output of the "T" network. This tuner is ideal for base or portable operation. It also is very effective as a mobile tuner for extending the useable frequency range of a resonant mobile antenna. An SWR metering system is incorporated with meter scales of 0-20 and 0-200 watts. The meter can be illuminated with an external 12 - 14 Vdc source.

SPECIFICATIONS

- 200 watts continuous power input.
- Silver plated 18 gauge inductor, wound on a 2 inch diameter powdered iron "donut." Forty seven position rotary tap selects inductance value.
- Two variable capacitors tune input and output. Rated at 1000 volts each.
- Frequency range 1.8 to 30 MHz.
- Powdered iron core balun is built in for balanced feeders.
- Rear panel input and outputs through SO-239 UHF connectors for coaxial lines. Terminal posts for long wire or balanced feedline type antennas and for ground. Front panel switch selects any of four antennas or the "by-pass" position.
- Meter scales for 0-20 and 0-200 watts. External 12 - 14 Vdc required for meter light. Rear panel connector provided.
- Size: HWD 3.5" x 8.75" x 8.5" (8.9 x 22 x 21.6 cm).
- Weight: 4 lbs 3 oz (1.9 kg).

MODEL 291 PORTABLE/MOBILE 200 WATT TUNER

The same "T" match circuit as the Model 254. Rear panel post for connecting a long wire and a SO-239 connector for a coax fed antenna. Uses the metering in your transceiver for tuning. Small, rugged, lightweight and easy to operate. Ideal for the "knock-about" world of portable or mobile operation.

KW DRY DUMMY LOAD MODEL 240KW

This forced air cooled dummy load is designed to operate at 1500 watts "key down" for up to two minutes, in the 1.5 to 150 MHz frequency range. It is ideal for tuning and testing high power transmitting equipment without radiating significant signal levels. A built-in probe provides a signal sample for evaluation, at the panel mounted MONITOR jack. An alarm sounds if load temperature exceeds the allowable limit. The load is provided by two, 100 Ohm 750 watt, ceramic resistors, connected in parallel. These specially designed resistors are chemically inert and temperature stable.

SPECIFICATIONS

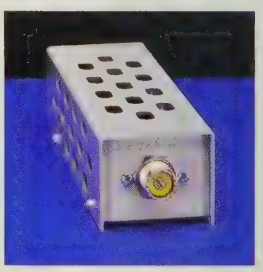
Impedance: 50 Ohms.
Typical VSWR: 1.5 to 30 MHz ∓ 1.2:1. 30 to 150 MHz = 1.5:1.
Power Ratings:

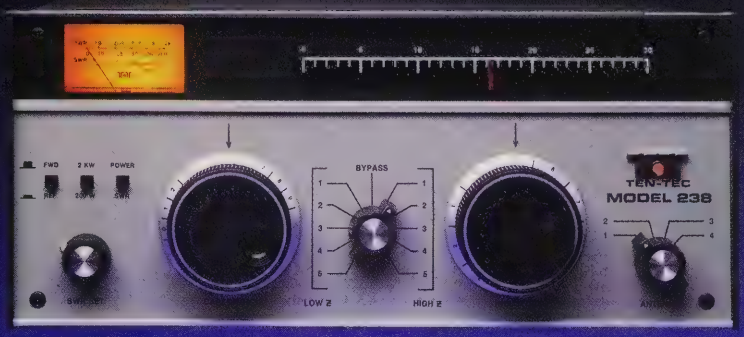
1500 watts	2:00 minutes
1000 watts	2:45 minutes
750 watts	4:30 minutes
500 watts	7:30 minutes
300 watts	continuous

RF Input Connector: SO-239, UHF type.
Fan and Alarm Power: 10 - 14 Vdc.
Size: HWD 4.5" x 6" x 13" (11.5 x 15.25 x 33 cm).
Weight: 6 lbs 6 oz (3 kg).

BROADBAND DUMMY LOAD MODEL 239

160 through 2 meters with 1:1 SWR. Through 70 cm below 2:1 SWR. 300 watts intermittent duty.





Full Power, Full Featured Manual Tuners Model 238

Model 238. The latest version of our tried and true "L" match design. This circuit is preferred among experts in the field because of its ability to match a broad range of impedances without the risk of self-resonance. All adjustments use calibrated scales for logging and a quick return to the same frequency and antenna. Rear panel fittings for four antennas. Three are dedicated for coax feedlines. The fourth can be coax, single wire or balanced feeders using the built-in high power balun. All are front panel selectable. Multi-meter (illuminated with external 12 Vdc) displays forward power in 0 - 200 and 0 - 2000 watt scales and SWR. The Model 238 is a great way to match broad operating interests to narrow-band or non-resonant antennas.

SPECIFICATIONS

Circuit: Modified "L" network.
Maximum RF Power: 2 kw with a load impedance of 3000 Ohms.
Frequency Range: 1.8 to 20 MHz.
Output Matching Range: At least 10:1 SWR, any phase angle.
Maximum Impedance, Balanced Feedline: 500 Ohms.
Input Impedance: 50 Ohms.
Input/Output Connectors: Input and four antenna coax connectors are SO-239, UHF type. Studs with wing nuts for single wire and balanced feeders.
Variable Capacitor Voltage Rating: 3.5 kV.
Inductance: 28 uH silver plated roller inductor.
Size: HWD 5.5" x 13" x 11". (13.9 x 33 x 27.9 cm).
Weight: 9 lbs (4.1 kg).

For the Builder...

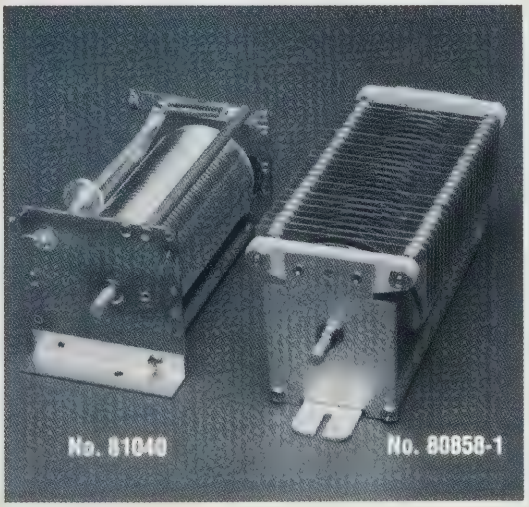
HARD TO FIND TUNER/AMPLIFIER COMPONENTS

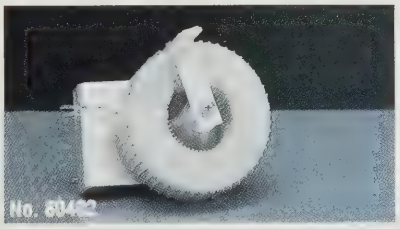
Roller inductor, as used in our Model 238 antenna coupler, kilowatt rated with silver plated wire wound on solid coil form. Excellent roller and rotary inductor mechanical design for years of trouble free service. Inductance variable from .1 to 19 uH. Part number 81040.

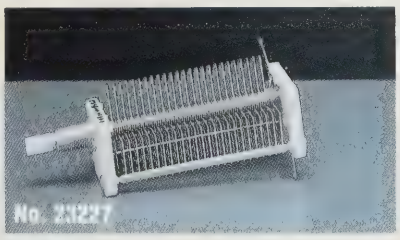
Kilowatt variable capacitor, as used in the Titan amplifier and Model 238 antenna coupler. Variable from 40 to 500 pF at 3.5 kv. Part number 80858-1.

Tapped inductor wound on a powdered iron core, as used in our Model 254, 200 watt antenna coupler. Variable in 47 steps from .1 to 20 uH. Part number 80402.

Variable capacitor, as used in our Model 254, 200 watt antenna coupler. Tuning range is 1 to 207 pF @ 1 kv. Part number 23227.







Consumer Electronics Interference Filters

Nothing focuses attention on amateur radio quite like a ripped up TV picture or hi-fi audio that is being substantially destroyed by a single-sideband signal. Finding the cause of the interference can be a challenge that ranks right up there with convincing your family or neighbors that reading a book is more fun than watching TV. The successful approach is to eliminate possibilities one at a time. The first step is a quality low pass filter in your transmission line. The second step is to install an effective high pass filter at the TV/FM receiver.

LOW PASS, 2 KW COAXIAL LINE FILTER MODEL 5061.

This is a 9th order, Chebyshev circuit, with less than 0.2 dB of loss within the passband. 50 dB attentuation at 50 MHz, with 70 dB ultimate, attenuation in the stopband. Unlimited operation at 1500 watts at up to 2:1 SWR. Rugged extruded aluminum housing with SO-239 UHF input/output connectors.

HIGH PASS TV/FM FILTER MODEL 5060.

Forty dB of attenuation below 30 MHz. Insertion loss 2 dB or less. Extruded aluminum case with a female type F chassis connector at one end and a male type F connector on a 4" RG-59 extension at the other end.

The "Closet Kilowatt"...

The ultimate XYL pleaser. The entire station enclosed in a handsome, color matched, cabinet measuring 19″ high x 21″ wide x 18″ deep. With only the antenna, power and ground as external connections, the station almost even looks like "wireless." The cabinet is all aluminum with sturdy internal reinforcing members and all welded assembly. Light grey baked enamel finish. Recessed handholds. This idea may change the entire image of ham radio, at least in the eyes of those that see your shack.

Rack Mount Kits

RM-420 RACK MOUNT KIT
For the Model 420 Hercules II.

RM-425 RACK MOUNT KIT
For the Model 425 Titan.

RM-500 RACK MOUNT KIT
For the Omni V or Paragon.

RM-253 RACK MOUNT KIT
For the Model 253 automatic tuner.

RM-238 RACK MOUNT KIT
For the Model 238 manual tuner.

RM-P0175-19
1.75″ x 19″ blank panel. Use when three Ten-Tec units are mounted.

RM-P0700-19
7″ x 19″ blank panel. Use when Ten-Tec units are mounted.

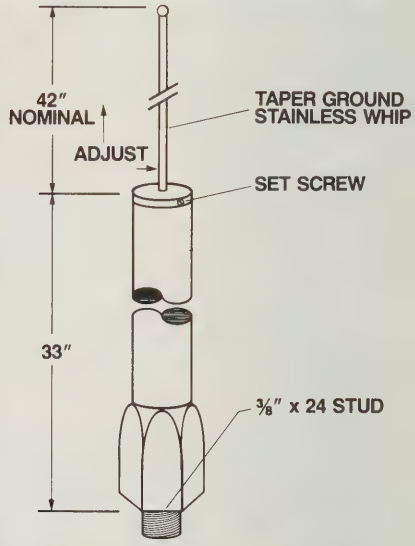
RM-19-1750 CABINET
With panel opening 19″ wide x 17.5″ high.

The Ultimate HF Mobile Antennas

HF mobile operation is a world of compromise under the best conditions. Give yourself a "break" and start with a good antenna system. Our 200 watt, linear loaded design is the best compromise between radiation efficiency and mechanical reality. The loading coil is precision wound on a most durable PVC tube and then weather-protected with a heat shrink jacket. All fittings are chrome plated brass. The taper ground, stainless steel whip is vertically adjustable at the center fitting for "no-tears" tuning. The over-all height of 78″ or less, combined with the low profile design, results in minimum wind load and eliminates the need for a spring, and it clears most over-head obstacles. The no-spring installation results in less tilting and de-tuning. Band identification is permanently stamped into the base fitting. May be used with any mount that accepts a ⅜″ x 24″ stud.

MODEL 3101. 42″ REPLACEMENT WHIP. USE WITH ALL MODELS. (SUPPLIED WITH EACH ANTENNA.)

MODEL 4010. 10 meters
MODEL 4012. 12 meters
MODEL 4015. 15 meters
MODEL 4017. 17 meters
MODEL 4020. 20 meters
MODEL 4030. 30 meters
MODEL 4040. 40 meters
MODEL 4075. 75 meters.
MODEL 4080. 80 meters.



MODEL 293.
Mobile mount. Can be floor or under-dash mounted. Quick-release lever lock-in system.

TEN-TEC

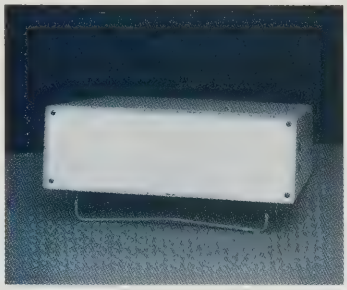
MODEL 3001. MOBILE MATCHER
Mounts at feed point of the antenna mount. Switch selectable fixed value capacitors plus a "bypass" position. Recommended for minimum SWR on 20, 30, 40, 75 and 80 meters.

Equipment Enclosures
And Project Boxes

Since Ten-Tec was founded in 1968, we have been a designer and producer of metal and plastic enclosures. The cabinetry for our own electronic equipment is produced in-house and we are a major supplier of custom enclosures for other equipment manufacturers throughout the United States. Shown below, is a cross section of our catalog line of enclosures. Quality material, quality designs and quality workmanship. The finishing touch for your building efforts.

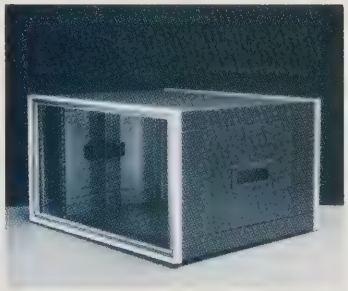
CONSTRUCTO SERIES B.

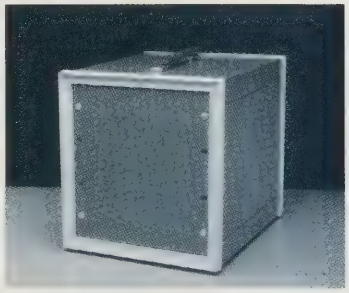
Unique in all the world. Variable chassis deck height for design flexibility. Aluminum chassis and panels with steel top and bottom cabinet. Sizes from HWD 2.5″ x 6″ x 5″ to 5.5″ x 12″ x 9″. Blue or Black.



PORTABLE AND DESK TOP, PANEL MOUNT "RACKS."

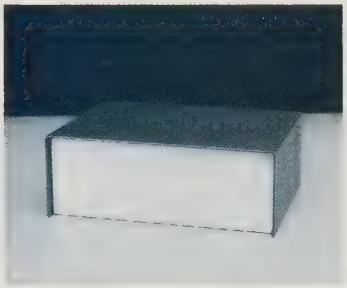
Handsome, rugged and all aluminum. 19 inch widths with vertical panel openings from 3.5″ to 17.5″. 9 inch widths with vertical panel openings from 5.25″ to 10.5″. Optional top mounted carrying handles or side mounted recessed grips. Available unfinished or "Ten-Tec" light grey.

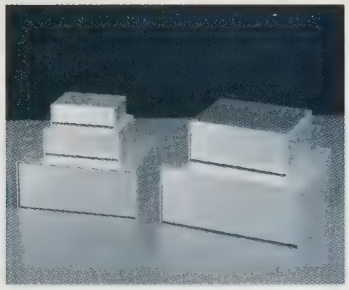




"T" SERIES PROJECT BOXES.

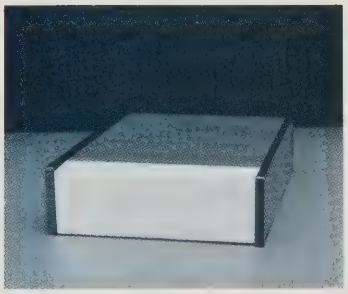
Inexpensive and easy working aluminum. Six standard sizes from HWD 1.96″ x 4.27″ x 3.9″ to 3.09″ x 8.27″ x 5.76″. "TP" models unpainted. "TG" models painted grey with black top cover. "TW" models painted beige with vinyl clad walnut top cover.

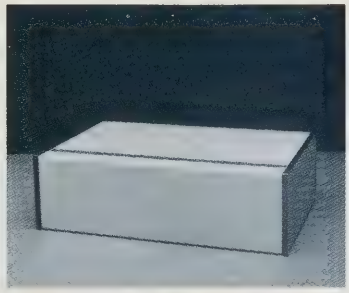




"D/M/J/L/F" SERIES.

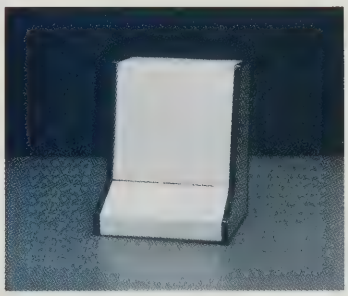
Four piece design with molded Cycolac® end caps. Wrap around front/bottom and top/rear covers. Sizes from HWD 2.25″ x 3.8″ x 5.68″ to 4.3″ x 14″ x 10.3″. Grey with black end panels or, beige with vinyl clad walnut trim.

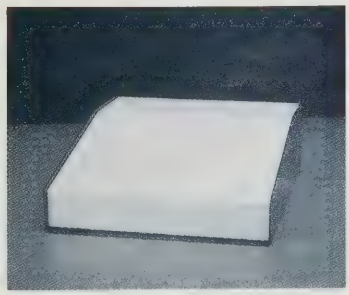




"S/H/V" SERIES.

Five and six plane designs for special applications which require a keypad or keyboard. Vertical styles for applications with active displays and/or speakers. Broad range of sizes. Easy to use metal and plastic construction for that professional, finished look. Available in several finishes and colors.





The Ten-Tec Story

All Ten-Tec products are produced in our 40,000 square foot plant located in the foothills of the Great Smoky Mountains. The basic processes are done in-house including the design and manufacture of printed circuit boards, plastic molding, sheet metal fabrication and finishing, and of course electronic assembly and testing. We produce our own tooling in our well equipped tool and die shop. Our development lab and quality control department are exceptionally well staffed and supported by the latest in instrumentation.

We produce custom enclosures for other equipment manufacturers and a standard catalog line of metal enclosures. We produce custom tools and dies for many manufacturers in the region. This unique combination of in-house processes ensures our ability to produce equipment of the highest quality, reliability and value.

We are proud of our reputation for customer service and product support. Our philosophy is that a sale is the beginning of a happy relationship. We provide service on our products that have been discontinued for many years, and we do so promptly and at an honest charge. Ten-Tec solves communications problems. If you have a special need, try us. We may have a cost effective solution. Your inquiry will be most welcome.

Ten-Tec manufactures communications electronics for non-amateur radio applications too. Some are custom designs for special applications and some are treated as catalog products.

PRECISION TOOL AND DIE SHOP. Almost in the "secret weapon" category is our in-house tool and die shop. For 20 years, we have been a supplier of superbly designed and crafted molds, forming dies and production jigs and fixtures for our own use as well as many other manufacturers throughout the region. Our well-equipped shop is staffed with toolmakers with many years of experience. You are not likely to be a customer for tools and dies but if your employer is, they may profit from discussing their needs with us. You do benefit from the design flexibility and "bottom line" economics resulting from this in-house capability.

HF-SSB TRANSCEIVER, MODEL 150 SERIES.

This is a 100 watt PEP transceiver that operates in the 2 to 12 MHz range. "No-tune" solid state design is ideal for non-technical operators. All modes. Primary power is 12/14 Vdc. Ideal for mobile or base operation. Excellent receive and transmit performance, channelized for simplicity, highly reliable, compact and weighs only 10 lbs.

HF-SSB MANPACK TRANSCEIVER, MODEL 120 SERIES.

The 120 Series is available in three models that operate in the 3 to 5 MHz, 5 to 8 MHz or 8 to 12 MHz bands, 20 watts PEP. The unit is powered by a self-contained re-chargeable ni-cad battery. Completely portable, small, lightweight (10 lbs including battery pack), all solid state, built-in antenna and channelized to customer specifications.

...America's Best!

TEN-TEC

Highway 411 East
Sevierville, TN 37862, U.S.A.
(615) 453-7172
Fax: 615-428-4483
Customer Service: 615-428-0364

MADE IN USA

MADE IN USA

TEN-TEC AMATEUR RADIO EQUIPMENT

America's Best!

The Paragon, Performance Plus ..., Model 585

PARAGON HF TRANSCEIVER, Model 585

All mode versatility and a transmitted signal you will be proud of. A receiver that has set new standards for sensitivity and quietness. Receives from 100 kHz to 29.999.99 MHz. Transmits on all bands from 1.8 MHz to 29.999.99 MHz with 100 watts output. SSB, CW, real FSK and optional FM. Standard equipment includes speech processor, noise blanker, dual VFOs, TX split, RX split and QSK with a changeover time of 30 ms or less. Five I-F filter positions with the 6 kHz AM filter and 2.4 kHz SSB filter, standard. Optional 1.8 kHz, 500 Hz and 250 Hz filters are selectable independent of mode. Two selectable tuning rates. Passband tuning, notch filter, audio bandpass filter, tone control, squelch and more!

Sixty-two programmable memories that store frequency, mode, filter selected, channel number and a 7 character alpha-numeric "tag" for entering channel I.D., tuner or amplifier settings, etc. Scan rate is selectable and as each memory is scanned all of the stored information is displayed (what a light show!). Alternately, the memories can be tuned with the main tuning knob.

Frequency selection is with the main tuning knob, direct keypad entry or up/down buttons that will shift in one kHz or one MHz increments or to the next ham band. DISPlay button selects 24 hour clock or date or tag. VOICE button causes a voice frequency announcement with optional synthesized voice board installed.

Rear panel controls are provided to adjust the VOX, CW monitor level and tone, and SSB sidetone monitor level. Switching is provided to control conventional linear amplifiers and of course, high speed switching for QSK linears, such as the Titan. Other rear panel inputs and outputs for transverters, FSK (170 Hz shift), fixed level audio out, audio in, external speaker, aux dc jack and provision for the optional RS-232 control interface. An absolute delight for the all mode operator.

The Paragon is the result of a three year engineering effort. We are proud of the Paragon and we think it has set new standards of excellence in synthesized rigs. Check it out yourself. We think that you will share our pride in the Paragon.

GENERAL SPECIFICATIONS

Frequency Range: Receive: 100 kHz to 29.9999 MHz. Transmit: 1.6 to 29.9999 MHz.
Frequency Control and Readout: Microprocessor controlled digital PLL synthesizer. 10 Hz resolution.
Frequency Stability: Worst case, 1 PPM per degree C. at 29.999 MHz.
Frequency Accuracy: ± 100 Hz @ 25 degrees C.
Antenna Impedance: 50 ohm unbalanced.
PC Boards: 14 double-sided, 9 single-sided .062" glass-epoxy.
Power Required: Receive = 1.5A. Transmit = 20A. 12 - 14 VDC.
Dimensions: HWD 5¾" x 10¾" x 17". 14.6 x 27.3 x 43.2 cm.
Net Weight: 16 lbs. 7.25 kg.

TRANSMITTER

Modes: USB & LSB (J3E), CW (A1A), FSK (F1A); FM (F3E) optional (Model 256).
DC Power Input: Maximum 200 watts.
RF Power Output: ALC stabilized, adjustable, 25 to 100 watts (into 50 ohms) with front panel RF OUT control.
Microrphone Input: Low impedance, bias voltage for electret provided.
CW Sidetone: Internally generated, adjustable tone and volume independent of AF GAIN control.
SSB Generation: 9 MHz, 8-pole crystal ladder filter. Balanced modulator.
Carrier Suppression: Greater than 60 dB.
Unwanted Sideband Suppression: Greater than 60 dB at 1.5 kHz AF input.
Harmonic Emissions: Greater than 45 dB below peak power output.
Spurious Output: Greater than 50 dB below peak power output.
Third Order Intermod Products: -30 dB from two-tone at 100 watts PEP.
Metering: Switchable forward power, SWR, collector current or audio processing level on SSB.
CW Offset: 750 Hz automatic.
FSK Shift: 170 Hz.
Transmit Offset Tuning Range: ± 99.9 kHz.

RECEIVER

Modes: USB, LSB, CW, FSK, AM, (FM optional).
Sensitivity:

	.1 - 1.6 MHz	1.6 - 29.999 MHz	
SSB/CW/RTTY	.5 uV	.15 uV	10 db S/N@ 2.4 kHz
AM	3.5 uV	1.0 uV	10 dB S/N @ 6.0 kHz
FM	1.0 uV	.3 uV	12 dB SINAD @ 15 kHz

Selectivity:

	-6 dB BW	-60 dB BW	Shape Factor
Standard AM	6.0 kHz	11.25 kHz	1.875:1
Standard SSB	2.4 kHz	3.36 kHz	1.87:1
Opt. 1.8 kHz SSB (Model 288)	1.8 kHz	2.9 kHz	1.60:1
Opt. 500 Hz CW (Model 285)	500 Hz	1.4 kHz	2.80:1
Opt. 250 Hz CW (Model 282)	250 Hz	.85 kHz	3.40:1
Standard FM	15 kHz	30 kHz	2.00:1

Attenuator: -20 dB for 1.6 to 29.999 MHz, -10 dB for .1 to 1.6 MHz.
I-F Frequencies: 1st = 75 MHz, 2nd = 9.0 MHz, 3rd = 6.3 MHz (FM 3rd = 455 kHz).
Image Rejection: Greater than 80 dB.
I-F Rejection: Greater than 70 dB.
Noise Blanker: Switchable on/off with adjustable width.
Dynamic Range: 100 dB.
Blocking Dynamic Range: + 16 dBm for 1 dB compression of an S9 signal, frequency offset = 50 kHz. -2 dBm for 1 dB compression of an S3 signal, frequency offset = 50 kHz.
Third Order Intercept: + 18 dBm.
Noise Floor: -132 dBm @ 2.4 kHz BW.
Squelch Sensitivity: Less than .6 uV.
Receiver Recovery Time: Less than 27 ms.
Receiver Offset Tuning Range: ± 99.9 kHz.
Pass Band Tuning I-F Shift: ± 1.2 kHz.
Audio Output: 1.5 watts @ 8 ohms.
Notch Filter: 250 to 2.2 kHz, greater than 50 dB notch depth.
Audio Bandpass Filter: 4 pole, variable center frequency 220 to 1.7 kHz, 35% bandwidth @ -6 dB.
Tone Control: Variable 15 dB rolloff @ 5 kHz.

Paragon Options

Model 256, FM Board.
This easily installed module adds FM transmit and receive capability. System bandwidth is 5 kHz.

Model 257, Voice Synthesizer Board.
This plug-in board announces the frequency displayed when the VOICE button is pressed.

Model 258, RS-232 Interface Board.
Provides remote computer control of frequency, mode, filter selection, VFO selection, all memory and scan features including memory programming and the other functions controlled from the push-button panel on the face of the Paragon. Supplied with command data for writing the program. Program discs are available from Ten-Tec for some of the more popular computers.

Model 259, Universal ALC Annunciator.
This is great for the vision impaired operators and can be installed in any transceiver with ALC. When the mic gain is advanced to the proper level, a beep sounds.

Classic Corsair II, HF Transceiver, Model 561

The CORSAIR II is unique in all the world. This is the only full featured ham transceiver manufactured today that uses a crystal mixed, permeability tuned oscillator. We continue to offer you this choice for a very good reason, superior receiver performance. Strong adjacent signals are effectively rejected and the extremely low noise floor does not vary when strong adjacent signals are present. The ability of a PTO controlled receiver to dig out weak signals that are surrounded by "heavy hitters" is hard to beat.

Frequency tuning versatility is also unique. The main knob tunes at 18 kHz per revolution, without "incrementing." Two slower tuning rates are provided by the dual range offset control. The offset tuning is selectable to control the receiver or the transmitter, or in "transceive."

The pass band tuning in combination with 16 pole crystal ladder filtering provides enviable selectivity. Our 50+ dB notch filter virtually eliminates carrier type interference. An eight pole audio bandpass filter is also standard. Numerous features are included to delight the all-mode operator. The I-F filters are selectable independent of mode. QSK with a changeover time of 30 ms or less is great on CW and AMTOR. An electronic CW keyer with a 40 character memory is built in. A "spot" button makes it easy to "zero" a CW signal. Selectable AGC—fast, slow or off. SSB performance is enhanced with an excellent speech processor that is standard equipment as is a noise blanker with adjustable level and width controls.

All nine ham bands, from 1.8 to 30 MHz, are covered using a 12 position band switch. Each position provides 500 kHz plus 40 kHz overshoot at the band edges. Most of the MARS frequencies are included. WWV is received at 10 MHz.

The solid state, broadband "no tune" 200 watt input final amplifier (pioneered by Ten-Tec) is a solid performer too. It will load a broader range of impedances and it does not "fold back" in key-down modes. De-rated components and excellent heat dissipation allow transmitter operation at full power, without auxiliary cooling, including the "key-down" modes with normal amateur duty cycles. The ALC control allows continuous adjustment of the output power level from 25% to 100%, independent of input drive levels. This is a great feature when using a low-drive amplifier, such as the Titan.

If your number one priority is outstanding all mode performance on the ham bands, and simplicity is still a virtue, you may be the kind of a purist that deserves a CORSAIR II.

GENERAL SPECIFICATIONS

Frequency Coverage: 160, 75/80, 40, 30, 20, 17, 15, 12 and 10 meters in twelve 500 kHz segments plus 40 kHz overshoot at upper and lower band edges.
Front Panel Multimeter: Reads power amplifier collector current, forward power, SWR, speech processing level and RX S-meter.
Front Panel Connections and Controls: BP FILTER; PBT; NOTCH; AF GAIN; POWER; RF GAIN/ATTN; DRIVE; bandswitch; main tuning knob; MODE; METER switch; KEYER SPEED; N.B. LEVEL/N.B. WIDTH; ALC threshold; PROCESS level; QSK/VOX select; AGC switch; XTAL switch; OFFSET SELECT switches (2); SPOT push-button; PHONES; MIC.
Rear Panel Connections and Controls: High speed QSK output jack (open collector); EXT T/R jack (relay closure); SPARE jack (uncommitted RCA phono); AUX 12 Vdc jacks (2); KEYER MEM. jack for controlling keyer memory; standard CW KEY jack; PTT jack; VFO IN/VFO OUT; AUDIO OUT; ACCESSORIES socket; GND terminal; EXT. SPKR jack; KEYER PADDLE jack; POWER socket; SO-239 ANTENNA connector; RX-TRX switch for separate RX antenna; RX antenna RCA jack; DELAY, GAIN, ANTI-VOX controls.
Power Required: 12-14 Vdc, 850 mA receive, 18.5 A transmit.
Dimensions: HWD 5.25" x 15" x 14" (13 x 38 x 36 cm) with bail retracted.
Net Weight: 14 lbs (6.4 Kg).
Frequency Display: 6 digit (to 100 Hz) amber LED.
Frequency Stability: Less than 15 Hz change per F degree averaged over a 40 degree change from 70 to 110 degrees F after 30 minute warm up. Less than 10 Hz change from 105 Vac to 125 Vac using a Ten-Tec power supply.

TRANSMITTER SPECIFICATIONS

Power Output: Broadband, solid state "no tune" amplifier with 85 to 100 watts RF out on all bands. Full power TX for up to 20 minutes without auxiliary cooling.
Output Impedance: 50 Ohm, unbalanced.
Iambic Keyer: Front panel speed adjustable from 8 to 50 wpm. Includes a 40 character memory, controlled from the KR1B accessory keyer.
Speech Processor: Audio type, processing level front panel adjustable.
CW Sidetone: Internally generated with adjustable tone and volume.
Full Break-In QSK: TX/RX changeover time of 30 mS or less.
ALC Control: Front panel adjustment sets RF output from 25% to 100%. Operates independently of input mic level, speech processing and CW drive. Output remains constant until you change it.
Microphone: Low or high impedance, 5 mV output. Polarizing voltage for electrets available at mic connector.
SSB Generation: 9 MHz, 8 pole crystal ladder filter, balanced modulator. Carrier and unwanted sideband suppression, 60 dB typical.
CW Offset: 750 Hz, automatic.
Spurious Emission: Down 45 dB or better at full output.

RECEIVER SPECIFICATIONS

Sensitivity: 0.25 uV for 10 dB S/N ratio.
Selectivity: 16 pole crystal ladder filtering, 2.4 kHz bandwidth, 1.6:1 shape factor at 6/60 dB. Three position front panel switch selects standard 2.4 kHz, optional 1.8 kHz, 500 Hz or 250 Hz filters. All four may be installed with 2.4, 1.8 kHz and 500 Hz accessible in SSB mode and 1.8 kHz, 500 and 250 Hz accessible in CW mode.
Noise Floor: –129 dBm at 2.4 kHz bandwidth.
Intercept Point: +5 dBm.
Dynamic Range: 95 dB at 200 Hz bandwidth.
Notch Filter: Greater than 50 dB notch adjustable from 200 Hz to 3.5 kHz.
Audio Bandpass Filter: 8 pole active filter centered at 750 Hz variable from "filtered" to "flat" response.
Passband Tuning (PBT): Tunes 2nd I-F frequency 3 kHz.
Noise Blanker: Switchable on/off with adjustable level and width.
Offset Tuning: Dual range, selectable to offset RX, TX or TRX.
Antenna RX Pre-Amp: Selectable on/off, 20 dB gain.
Spot Button: To accurately "zero" a CW signal.
AGC: Selectable fast, slow and off.
I-F Frequencies: 9 and 6.3 MHz.
I-F Rejection: Greater than 60 dB.

The New OMNI V America's Best Just Got Better!

The OMNI V, Model 562, is a kissin' cousin to both the CORSAIR II and the PARAGON. The crystal mixed oscillator of the CORSAIR II has been married to the digital technology and phase locked loop frequency tuning system in the PARAGON. The result is phase noise performance that is superior to any other synthesized rig around.

Many of the nifty features made possible by digital technology are included. Dual VFO's with A-B-split select, frequency stability of a PLL, 25 tune/scan memories, VFO to MEM and MEM to VFO and RS-232 interface option. The memories are nonvolatile RAM and are retained until you change them. The status registers and clock are backed with a lithium battery (2 year life) so that when the rig is powered up, the status is the same as when you turned it off.

The OMNI V operates USB, LSB, QSK CW and real FSK. FM is optional. All bands from 160 through 10 meters are push button selectable. Each band position covers 500 kHz plus 24 kHz over-shoot at the low end and 32 kHz at the top. Tuning is in your choice of 10 Hz or 50 Hz increments on SSB, CW and FSK. With the FM option, tuning is in 100 Hz or 500 Hz increments. Up/Down buttons tune in 10 kHz or 50 kHz increments.

A noise blanker and audio speech processor are standard equipment. The rear panel has a full compliment of inputs, outputs and controls for the convenience of the all-mode operator. High speed key lines are provided for QSK control of a fast switching amplifier, such as the TITAN. Changeover in QSK is less than 30 ms, great for CW and the digital modes.

The front panel is spacious and friendly. The vacuum fluorescent display uses large, easy to read elements. The frequency display doubles as the 24 hour clock display when the CLOCK button is pressed. Other elements indicate VFO status and warn when the memories are full.

All four of the 6.3 MHz I-F filter positions are push-button selectable, independent of mode. A second filter socket is provided in the 9 MHz I-F for an optional 1.8 kHz, 500 Hz or 250 Hz filter which is selected with the NARROW button. This doubles the number of poles in the crystal filter network and even further reduces the impact of adjacent strong signals.

If you can survive without a general coverage receiver in your HF transceiver, the elegant OMNI V is a great choice. If you are also a serious DX-er and/or contester, the OMNI V is the only choice.

Specifications subject to change without notice.

GENERAL SPECIFICATIONS

Frequency Range: Transmit and receive on all ham bands from 160 through 10 meters in their entirety. Twelve 500 kHz segments plus 24 kHz over-shoot at the low end and 32 kHz at the high end.
Frequency Control: Digital phase locked loop with crystal mixed oscillator.
Frequency Stability: Worst case, 1 PPM per degree C at 29.999 MHz.
Frequency Accuracy: ± 100 Hz at 25 degrees C.
Antenna Impedance: 50 Ohms, unbalanced.
Printed Circuit Boards: G-10 epoxy.
Power Required: Receive = 1.5 A. Transmit = 20 A. 12-14 Vdc.
Dimensions: HWD 5¾" x 14¾" x 17". 14.6 x 27.3 x 43.2 cm.
Net Weight: 16 lbs. 7.25 Kg.

TRANSMITTER

Modes: USB and LSB (J3E), CW (A1A), FSK (F1A). Optional FM (F3E).
DC Power Input: 200 Watts maximum.
RF Power Output: ALC stabilized, adjustable from 20 watts to 100 watts (50 Ohm load) with front panel RF OUT control.
Microphone Impedance: 200 Ohms to 50k Ohms. Bias voltage for electret mic is provided in front panel connector.
CW Sidetone: Internally generated with rear panel level and tone adjustments, independent of front panel audio level control.
SSB Generation: 9 MHz, 8 pole crystal ladder filter, balanced modulator.
Carrier Suppression: Greater than 60 dB.
Unwanted Sideband Suppression: Greater than 60 dB at 1.5 kHz AF input.
Harmonic Emissions: Greater than 45 dB below peak power output.
Third Order Intermod Products: –30 dB from two tone at 100 watts PEP.
Metering: Switchable forward power, SWR, collector current or audio processing level on SSB.
CW Offset: 750 Hz.
FSK Shift: 170 Hz.

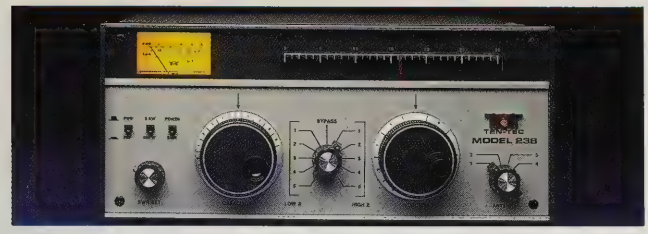
RECEIVER

Modes: LSB, USB, CW and FSK. FM with optional board.
Sensitivity: .15 uV for 10 dB signal to noise ratio at 2.4 kHz typical. With FM option, .3 uV for 12 dB SINAD at 15 kHz.
Selectivity: (see chart for Paragon)
Attenuator: –20 dB.
I-F Frequencies: 1st I-F 9 MHz, passband tuning I-F 6.3 MHz.
Image Rejection: ►60 dB.
I-F Rejection: ►60 dB.
Noise Blanker: Switchable on/off with width adjustment.
Dynamic Range: 97 dB useable.
Third Order Intercept: + 12 dBm.
Noise Floor: –133 dBm at 2.4 kHz bandwidth.
Squelch Sensitivity: Less than .6 uV.
Receiver Recovery Time: Less than 30 ms.
Pass Band Tuning I-F Shift: ± 1.2 kHz.
Audio Output: 1.5 watts at 8 Ohms.
Notch Filter: 250 Hz to 2.2 kHz, greater than 50 dB notch depth.
Audio Bandpass Filter: 4 pole, variable center frequency 220 Hz to 1.7 kHz, 35% band width at –6 dB.
Tone Control: Variable 15 dB roll-off at 5 kHz.

DO YOU KNOW...

Ten-Tec is in several businesses. We produce tools and dies for our own use as well as many other manufacturers. We fabricate a complete line of metal and molded plastic equipment enclosures as used on our products and those of other equipment manufacturers from coast to coast. We design and build special application electronics for government and industry around the world. If your business can benefit from this extraordinary in-house capability, we would be pleased to talk to you.

HF Accessories



Two KW Antenna Tuner

The latest version of the highly regarded Ten-Tec antenna tuner is now the Model 238. The 238 has been re-styled to match our transceivers and looks great in your shack, whether your layout is ''look alike'' or ''mix and match.'' This tuner adds a great deal of versatility. It will load virtually any unbalanced (coax fed or long wire) antenna. The high power balun is built in as standard which allows the use of balanced feeders also. Full coverage from 1.6 to 30 MHz. The modified ''L'' network will tame an SWR of at least 10:1, any phase angle, without false load problems. The lighted slide rule dial and calibrated tuning knob skirts make it possible to log settings and quickly QSY to the same frequency and antenna, without going through the tuning process again. Lighted multi-meter reads power in two ranges, plus SWR. A great way to operate all bands, including WARC and MARS, with something less than a world-class antenna farm.

SPECIFICATIONS

Circuit: Modified ''L'' network.
RF Power: 2 KW.
Frequency Range: 1.8 to 30 MHz.
Output Matching Range: At least 10:1 SWR, any phase angle, 1.8 to 30 MHz. Maximum impedance at full power, 3000 ohms. Maximum impedance, balanced load using accessory balun, 500 ohms.
Input Impedance: 50 ohms, SO-239 connector.
Capacitor Voltage Rating: 3.5 kV.
Inductance: 28 uH silver plated roller inductor.
Size: HWD 5.5″ x 13″ x 11″ (13.9 x 33 x 27.9 cm).
Weight: 9 lbs. (4.1 kg).

REMOTE VFO, Model 263

This little beauty adds a whole lot of versatility to the CORSAIR II system. It uses the same type PTO as the CORSAIR II and can control transmit, receive or transceive frequency. You can also listen to both transmit and receive frequencies simultaneously! A balance control is provided for ''priority'' adjustment. A great feature in a DX pile-up. A momentary ''reverse'' button is provided to check your transmit frequency in any PTO configuration. Four crystal sockets are built-in and are front panel selectable, a nice touch if you are a net operator. Crystal controlled operation is possible on any of these bands:

160M	1.7 to 2.1 MHz
80M	3.4 to 4.2 MHz
40M	6.9 to 7.4 MHz
30M	10.01 to 10.6 MHz
20M	13.8 to 14.6 MHz
17M	18.05 to 18.6 MHz
15M	20.8 to 21.65 MHz
12M	24.5 to 21.65 MHz
10M	27.8 to 30.0 MHz

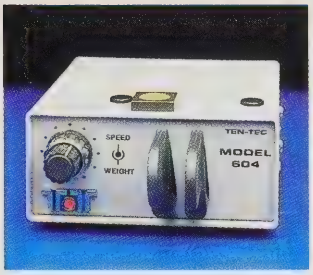
The 263 connects directly to the CORSAIR II using the prefabricated cables provided.

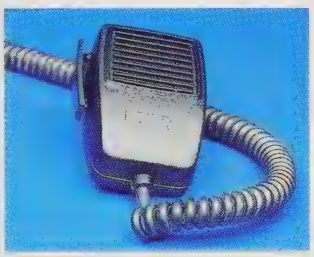
Size: HWD 5.25″ x 7.5″ x 12″. (13.3 x 19 x 30.5 cm).
Weight: 4 lbs. (1.8 Kg).

SPEAKER/POWER SUPPLY, Model 961

Designed for use with any Ten-Tec 100 watt rig. This highly regulated and very well filtered power supply uses 105 to 125 or 210 to 250 Vac 50/60 Hz, primary power, fuse protected. The output voltage is adjustable from 11.5 to 15 Vdc, factory adjusted to 13.8 Vdc and ''over-voltage'' protection is incorporated. Regulation is better than 3%, from ''no load'' to ''full load.'' A re-setting, electronic latching circuit breaker limits current for the protection of the power amplifier and is adjustable. Maximum load is 22 A. Ripple is less than 20 mV peak-to-peak at 20 A. The front panel mounted speaker is a ceramic magnet dynamic, 8 Ohm. The dc output cable is terminated into a 4 pin AMP MATE-N-LOC® which connects to any Ten-Tec transceiver. Two rear panel phono jacks may be used to supply dc to low power accessories.

Size: HWD 5.25″ x 7.5″ x 13.5″ (13.3 x 19 x 34.3 cm).
Weight: 18 lbs. (8.2 Kg).



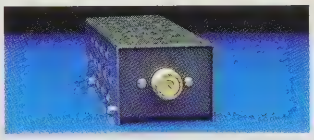


MICROPHONES FOR 525 (D), 546, 580

700A Hand mic, electret w/coiled cord and phone plug
705A Desk mic, electret with cord and phone plug

CIRCUIT BREAKER

1140 DC Models 546/560/561/562/580/585



BROADBAND DUMMY LOAD Model 239

160 through 2 meters with 1:1 SWR. Through 70 cm below 2:1 SWR. 300 watts intermittent duty.

DUAL PADDLE MEMORY KEY, CORSAIR II, Model KR1B/603

This Iambic paddle is designed to operate the keyer system built into the CORSAIR II, including operation of the 40 character memory. Paddle ''travel'' is adjustable. Paddle ''tension'' is adjustable using a magnetic system controlled with a single rotary knob. Keyer is powered from an auxiliary dc jack on the rear panel of the CORSAIR II.

Model 604

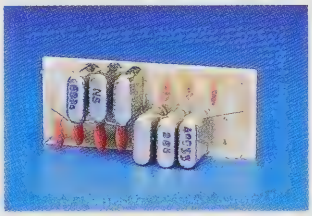
Iambic Electronic Keyer. Torque drive dual paddles, developed by Ten-Tec, pivot on low friction ball bearings and have fully adjustable magnetic tensioning to custom fit the 604 to your touch. Paddle travel is adjusted through access holes in the cabinet. Paddle contacts are silver with gold plated keyer contacts. Front panel adjustment of speed AND WEIGHTING. Full time dit and dah memories. Character speed range, 10 to 50 wpm. The top mounted button is a manual key-down control. A versatile keyer for any positive, low voltage circuit. Operates on 12 to 14 Vdc.

Model 605

Single Paddle Electronic Keyer. All of the electronic features of the Model 604. A traditional single paddle with spring tensioning is used. The 605 is ideal for mobile cw operation.

MICROPHONES FOR 560, 561, 562, 585

700 C Hand mic, electret w/coiled cord and connector
705 Desk mic, electret withcord and connector



HF ACCESSORY FILTERS

For 560, 561, 562, 580, 585 Transceivers
282 250 Hz 6 pole ladder filter
285 500 Hz 6 pole ladder filter
288 1.8 kHz 8 pole ladder filter

For 546/525 (D)
217 500 Hz 8 pole ladder filter
218 1.8 kHz 8 pole ladder filter
219 250 Hz 6 pole ladder filter
220 2.4 kHz 8 pole ladder filter

Titan, HF Linear Amplifier, Model 425

The Titan has it all! Maximum legal power with ease, all full power bands 160 through 15 meters (10 and 12 meters after authorized modification), lightning fast QSK for break-in cw and the digital modes and a two speed blower for quiet operation. This awesome performance from a desk top amplifier is made possible by the remote power supply and a pair of Eimac® 3CX800A7 ceramic triodes. The heart of the power supply is our own four core, tape wound Hypersil® transformer. This 41 lb behemoth is conservatively rated at 2.5 kVa CCS (9.2 kVa IVS) and is nearly noiseless, even at 1500 watts output!

Other features include a front panel, peak reading wattmeter using an instantaneous ten element LED bargraph display, PTT/VOX or QSK control line select switch, built-in SWR meter and an "over-drive" warning LED. 3:1 vernier TUNE and LOAD controls in combination with an outstanding RF deck design, make the Titan a real "pussy cat" to load and operate.

The Titan is styled to match our transceivers but it interfaces beautifully, no matter what exciter you are using. If you are ready to choose your dream amplifier, the Titan has it all! Check it out.

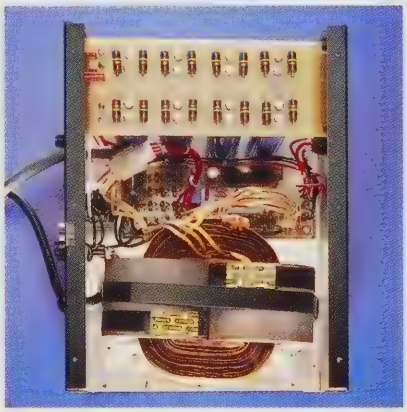
SPECIFICATIONS

Frequency Coverage: 1.8-2.0, 3.2-4.7, 6.5-8.5, 13.4-19.6, 17.6-23.0. With 10 meter modification, 17.6-26.5, 20.6-31 mHz.
Drive Power: 65 to 80 watts typical for 1500 watts output.
Efficiency: 50-65% depending on frequency, drive level and load.
Distortion: -35 dB from 1 KW RF output level.
Harmonics: -50 dB typical.
Input and Output Impedance: 50 ohms.
Transmit/Receive Control: Provision for PTT or QSK control lines, front panel selectable. T/R switching uses a Jennings® vacuum relay. RF sensing circuit prevents keying or un-keying if 10 mW of RF present on the RF drive line. Switching time less than 8 ms.
Tube Complement: Two Eimac® 3CX800A7 ceramic, external anode triodes in a grounded grid circuit. Total plate dissipation, 1600 watts.
Plate Voltage: 2400 Vdc, no load.
Over-Drive Protection: A front panel warning light turns on when grid current reaches the allowable limit. At the same time, the grid current limiting circuit takes over to protect the PA tubes.
Cooling: Ducted forced air, vertical exhaust, using a two speed centrifugal blower.
Metering: Full time plate current. Switch selected plate voltage, grid current, forward power or reflected power. Peak power is indicated on a 10 element LED bargraph display. The first nine elements are green—the tenth LED is red and indicates 1500 watts output.
ALC: Negative-going, adjustable threshold.
LED Status Indicators: Overdrive, Standby, Wait, Operate.
Primary Power: 220-250 Vac at 20 A, maximum. 117 Vac operation is possible but not recommended.
Protection: Primary line fuses, plate current fuse, ac line and high voltage interlocks.

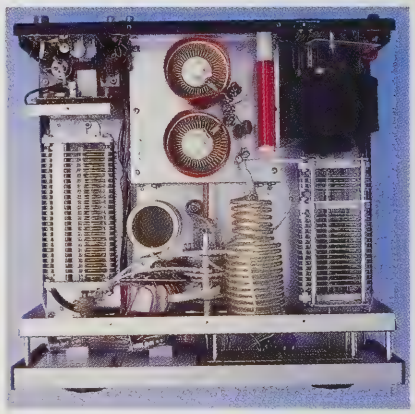
Front Panel Controls: Power ON-OFF, STANDBY-OPERATE, selectable control lines VOX/PTT or QSK. Plate TUNE and LOAD controls, BAND Switch, METER Switch.
Size: RF deck, HWD 5.25″x15.25″x15″, (13.3 x 38.7 x 76.8 cm). Power supply, HWD 8.25″ x 13.4″ x 10.25″, (21 x 34 x 60 cm).
Weight: RF deck, 17 lbs, (7.7 Kg). Power supply, 50 lbs, (20.5 Kg).

UPS shippable, factory packaged in three cartons; RF deck, power supply w/o power transformer, power transformer.

THE TITAN IS BACKED BY A 3-YEAR LIMITED WARRANTY

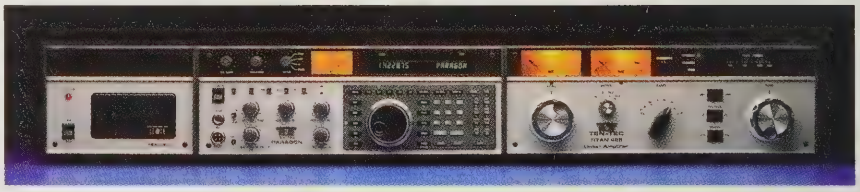


Power Supply



RF Deck

The ultimate in linear design and performance



Titan Paragon Station with 961 Power Supply

Hercules II No Tune HF Amplifier, Model 420

THE HERCULES II, SOLID STATE KW LINEAR AMPLIFIER

High-tech simplicity, base or mobile. Here is a compact, lightweight amplifier that offers a combination of unique features that can only be achieved using modern solid state technology. Instant on, 12-14 Vdc operation, no-tune broadband final and compact size. Add to that lightning fast QSK cw, remote control, superb linearity and a low drive requirement. Outstanding!

The HERCULES II is attractively styled to match the CORSAIR II, OMNI V or PARAGON and will interface nicely with virtually all transceivers. The front panel includes an analog multi-meter for collector current, voltage, forward power and SWR. A 10 element LED bar-graph display indicates peak output power. Band selection is made from the front panel switch or remotely controlled through a rear panel connector. A front panel speaker is built-in.

The Model 9420 115/220 Vac power supply is in a separate utility enclosure and connects to the RF deck using a 6 foot power cable. An additional 20 amps at 13.8 Vdc is provided to power a 100 watt exciter.

General coverage operation from 160 through 15 meters. (Through 10 meters after authorized modification.)

The HERCULES II is the ultimate in simplicity, ease of operation, versatility and reliability. And best of all, it is affordable! Another proud product from Ten-Tec.

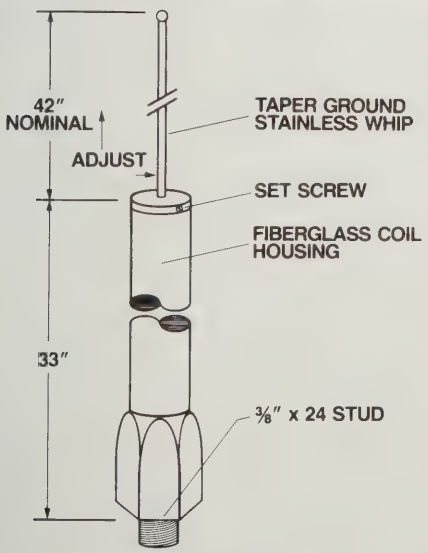
SPECIFICATIONS

MODEL 420, RF DECK

Operating Frequency Range: General coverage 1.6 to 29.999.99 MHz. Coverage is in seven bands which are front panel or rear panel remote selectable.
RF Power: 1000 watts input, 500/600 watts output, depending on frequency and load impedance.
Drive Power: 65 to 80 watts typical for 500 watts output.
Distortion: –35 dB from 500 watt output level.
Harmonics: –50 dB typical.
Input and Output Impedance: 50 Ohms unbalanced, ◄ 2:1 SWR.
Cooling: Internal forced air, rear panel exhaust.
Metering: Switch selectable forward power, SWR, Icc (collector current) and Vcc (Voltage). Ten element LED bar graph displays peak output power.
Primary Power: RF deck, 12 to 14 volts at 100 amps, maximum.
TX/RX Switching Time: 10 ms or less.
Duty Cycle: 100% typical Amateur service. 10 minutes maximum continuous key-down at 500 watts output.
Final Amplifier Transistors: Eight MRF458, or equivalent.
ALC: Internal, 1.5 dB range.
Protective Circuits: Over-voltage and over-current lockout. Front panel "OVERDRIVE" light.
Front Panel Controls: Multi-meter control switch, power on-off switch and band select switch.
Rear Panel Connections: RF in, RF out, DC input, TX/RX control jacks and remote control socket.
Size: HWD 5.25″ x 12″ x 14.5″.
Weight: 15 lbs.

MODEL 9420, AC POWER SUPPLY

Primary Power: Selectable 110/125 Vac at 14A or 220/250 Vac at 7A, 50/60 Hz.
DC Power Output: 13.5/14.5 Vdc at 4 x 25 amps. (20 amps for exciter).
Protection: Primary line fuses, over-voltage and over-current lockouts (from RF deck).
Size: HWD 12.5″ x 12.5″ x 9.25″
Weight: 58 lbs.



The Ultimate, HF Mobile Antenna System

HF mobile operation is a world of compromise. Give yourself a break and start with a good antenna system. The ULTIMATE series provides the best compromise between radiation efficiency and mechanical "reality!" The lower section is a fiberglass enclosed loading coil. The upper "stinger" is a top quality, stainless steel, taper ground whip. It is vertically adjustable for "no tears" tuning. The overall height allows use without a spring and clears most overhead obstacles. The overall profile provides the lowest wind resistance and as a result, less tilting and de-tuning. The entire assembly is environmentally protected for years of trouble free service. Use any mount with ⅜″ x 24 fitting.

MODEL 3110, 10 Meter Antenna, 72″
MODEL 3115, 15 Meter Antenna, 72″
MODEL 3120, 20 Meter Antenna, 72″
MODEL 3130, 30 Meter Antenna, 72″
MODEL 3140, 40 Meter Antenna, 78″
MODEL 3175, 75 Meter Antenna, 78″
MODEL 3180, 80 Meter Antenna, 78″
MODEL 3101, Replacement Stinger 42″

MODEL 3001, 20 - 80 Mobile Matcher

Model 3001

Mode B, Satellite Station Model 2510 B

SATELLITE STATION, MODE B, Model 2510B

The Model 2510B, mode B, satellite station is a 70 cm, 10 watt SSB and CW transmitter with a super-sensitive, low noise, 2 meter to 29 MHz receiver converter. The receive conversion idea takes advantage of the excellent selectivity and sensitivity that you already have in your HF station. Frequency tuning is with the PTO in the 2510B and the transmitter automatically tracks the receive frequency for "transceive" operation. "Split" operation is also provided. Two bands are included for full coverage of Oscar 10 and Oscar 13.

TRANSMITTER

Frequency Range: 435.0 to 435.895 MHz.
Output Power: Adjustable to 10 watts maximum.
Output Impedance: 50 ohms, unbalanced.
Modes: USB, LSB, CW. AFSK derived digital modes.
Sideband Generation: Balanced modulator through 4 pole monolithic filter.
Transmitter Switching: PTT through mic connector.
Carrier Suppression: 50 dB minimum.
Unwanted Sideband Suppression: 30 dB minimum at 1 kHz.
Spurious and Harmonic Output: Better than 50 dB below full power rating.
Microphone Input: Low or high impedance with 5 mV output. Polarizing voltage for electret mic available at connector.

RECEIVER

Frequency Range: 145.5 to 146.0 MHz. Converted to 29 MHz output.
Conversion Gain: 25 dB typical.
Image Rejection: Greater than 60 dB.
Noise Figure: Less than 2.5 dB. GaAsFet conversion.
Dynamic Range: 85 dB typical.

GENERAL

Power Requirement: 12 to 14 Vdc, 3 A maximum.
Size: HWD 4.5" x 7.6" x 11" (11.4 x 19 x 27.9 cm).
Weight: 6 lbs. (2.7 kg).

Linear Amplifier, 70 cm

LINEAR AMPLIFIER, 70 cm, ALL MODE, Model 2410

With type "N" connectors, Model 2410N

The 2410 is a 10 dB gain solid state, no-tune amplifier for operation from 430 to 450 MHz. 100 watts output with 10 watts drive. TX/STDBY switching can be controlled remotely with hard switching or will key automatically when 300 mW RF is sensed at the input circuit. The stripline design uses a high quality Teflon® circuit board and de-rated components throughout. Primary power is 12 to 14 Vdc at 20 A. Ideal for mobile, portable or base station use. A perfect companion for the 2510 Satellite station.

SPECIFICATIONS

Frequency Range: 430 to 450 MHz.
Output Power: 100 watts output with 10 watts drive.
Input Power: 15 watts maximum. RF sensing circuit keys amplifier at 300 mW.
Modes: SSB, CW, FM, RTTY.
DC Power: 12 to 14 Vdc at 20 A, typical.
Input/Output Impedance: 50 ohms, unbalanced.
Duty Cycle: 100%. typical amateur service.
Protection: Reverse voltage; over temperature kicks out at 170 degrees F, resets at 140 degrees F; internal 35 A fuse in dc line.
Delay: T/R delay adjustable in SSB mode.
RF Connectors: Model 2410, SO-239. Model 2410N, type "N".
Size: HWD 3.25" x 5.7" x 11.25" (8.3 x 15 x 29 cm).
Weight: 4 lbs., 14 oz. (2.2 kg).

2 Meter Amplifier, Model 2425

2 METER AMPLIFIER, 30 WATT, Model 2425

The model 2425 is a high quality, compact amplifier designed to be used with a hand-held transceiver. One to three watts of drive is amplified to thirty watts output. The amplifier is carrier operated and is ideally suited for mobile, portable or base station use.

SPECIFICATIONS

Frequency Range: 144 to 148 MHz.
Mode: Class C, FM or CW.
Input Power: 1 to 3 watts.
Output Power: 25 to 30 watts.
Harmonic Output: More than 60 dB below carrier.
Primary Power: 12 to 14 Vdc. 13.8 Vdc (negative ground) 5 A.
Impedance: 50 ohms input and output, unbalanced.
Switching: Carrier operated relay.
Size: HWD 2.25" x 4.12" x 5" (5.7 x 10.5 x 12.7 cm).
Weight: 1 lb. (.45 kg).

TEN-TEC WARRANTY AND PRODUCT SUPPORT

In 1968 Ten-Tec was founded by Albert Kahn, K4FW, and Jack Burchfield, K4JU. From the beginning, product support and customer service have been basic. Our philosophy is that a sale is the beginning of a friendship and that it is our obligation to provide fast and economical service if ever needed. The application of the principal of the "Golden Rule" and caring for our customers has contributed greatly to our success.

Our term of warranty is one year unless otherwise stated in the catalog listing. We promise you fast, thorough and caring service. If the unit is out of warranty, the service will be completed at a fair and honest cost. We strive to have all Ten-Tec owners happy ones.

...America's Best!

TEN-TEC

Highway 411 East
Sevierville, TN 37862, U.S.A.
(615) 453-7172
FAX: (615) 428-4483

MADE IN USA

MADE IN USA

TEN-TEC AMATEUR RADIO EQUIPMENT

The Paragon, Performance Plus Model 585

All mode versatility and a transmitted signal you will be proud of. A receiver that has set new standards for sensitivity and quietness. Receives from 100 kHz to 29.999.99 MHz. Transmits on all bands from 1.8 MHz to 29.999.99 MHz with 100 watts output. SSB, CW, real FSK and optional FM. Standard equipment includes speech processor, noise blanker, dual VFOs, TX split, RX split and QSK with a changeover time of 30 ms or less. Five I-F filter positions with the 6 kHz AM filter and 2.4 kHz SSB filter, standard. Optional 1.8 kHz, 500 Hz and 250 Hz filters are selectable independent of mode. Two selectable tuning rates. Passband tuning, notch filter, audio bandpass filter, tone control, squelch and more!

Sixty-two programmable memories that store frequency, mode, filter selected, channel number and a 7 character alpha-numeric "tag" for entering channel I.D., tuner or amplifier settings, etc. Scan rate is selectable and as each memory is scanned all of the stored information is displayed (what a light show!). Alternately, the memories can be tuned with the main tuning knob.

Frequency selection is with the main tuning knob, direct keypad entry or up/down buttons that will shift in one kHz or one MHz increments or to the next ham band. DISPlay button selects 24 hour clock or date or tag. VOICE button causes a voice frequency announcement with optional synthesized voice board installed.

Rear panel controls are provided to adjust the VOX, CW monitor level and tone, and SSB sidetone monitor level. Switching is provided to control conventional linear amplifiers and of course, high speed switching for QSK linears, such as the Titan. Other rear panel inputs and outputs for transverters, FSK (170 Hz shift), fixed level audio out, audio in, external speaker, aux dc jack and provision for the optional RS-232 control interface. An absolute delight for the all mode operator.

The Paragon is the result of a three year engineering effort. We are proud of the Paragon and we think it has set new standards of excellence in synthesized rigs. Check it out yourself. We think that you will share our pride in the Paragon.

GENERAL SPECIFICATIONS

Frequency Range: Receive: 100 kHz to 29.9999 MHz. Transmit: 1.6 to 29.9999 MHz.
Frequency Control and Readout: Microprocessor controlled digital PLL synthesizer. 10 Hz resolution.
Frequency Stability: Worst case, 1 PPM per degree C at 29.999 MHz.
Frequency Accuracy: ± 100 Hz @ 25 degrees C.
Antenna Impedance: 50 ohm unbalanced.
PC Boards: 14 double-sided, 9 single-sided .062" glass-epoxy.
Power Required: Receive = 1.5A. Transmit = 20A. 12 - 14 VDC.
Dimensions: HWD 5¾" x 14¾" x 17". (14.6 x 27.3 x 43.2 cm).
Net Weight: 16 lbs. (7.25 kg).

TRANSMITTER

Modes: USB & LSB (J3E), CW (A1A), FSK (F1A); FM (F3E) optional (Model 256).
DC Power Input: Maximum 200 watts.
RF Power Output: ALC stabilized, adjustable, 25 to 100 watts (into 50 ohms) with front panel RF OUT control.
Microphone Input: Low impedance, bias voltage for electret provided.
CW Sidetone: Internally generated, adjustable tone and volume independent of AF GAIN control.
SSB Generation: 9 MHz, 8-pole crystal ladder filter. Balanced modulator.
Carrier Suppression: Greater than 60 dB.
Unwanted Sideband Suppression: Greater than 60 dB at 1.5 kHz AF input.
Harmonic Emissions: Greater than 45 dB below peak power output.
Spurious Output: Greater than 50 dB below peak power output.
Third Order Intermod Products: -30 dB from two-tone at 100 watts PEP.
Metering: Switchable forward power, SWR, collector current or audio processing level on SSB.
CW Offset: 750 Hz automatic.
FSK Shift: 170 Hz.
Transmit Offset Tuning Range: ± 99.9 kHz.

RECEIVER

Modes: USB, LSB, CW, FSK, AM, (FM optional).
Sensitivity:

	.1-1.6 MHz	1.6-29.999 MHz	
SSB/CW/RTTY	.5 uV	.15 uV	10 dB S/N@ 2.4 kHz
AM	3.5 uV	1.0 uV	10 dB S/N @ 6.0 kHz
FM	1.0 uV	.3 uV	12 dB SINAD @ 15 kHz

Selectivity:

	-6 db BW	-60 dB BW	Shape Factor
Standard AM	6.0 kHz	11.24 kHz	1.875:1
Standard SSB	2.4 kHz	3.36 kHz	1.87:1
Opt. 1.8 kHz SSB (Model 288)	1.8 kHz	2.9 kHz	1.60:1
Opt. 500 Hz CW (Model 285)	500 Hz	1.4 kHz	2.80:1
Opt. 250 Hz CW (Model 282)	250 Hz	.85 kHz	3.40:1
Standard FM	15 kHz	30 kHz	2.00:1

Attenuator: -20 dB for 1.6 to 29.999 MHz, -10 dB for .1 to 1.6 MHz.
I-F Frequencies: 1st = 75 MHz, 2nd = 9.0 MHz, 3rd = 6.3 MHz (FM 3rd = 455 kHz).
Image Rejection: Greater than 80 dB.
I-F Rejection: Greater than 70 dB.
Noise Blanker: Switchable on/off with adjustable width.
Dynamic Range: 100 dB.
Blocking Dynamic Range: ± 16 dBm for 1 dB compression of an S9 signal, frequency offset = 50 kHz. -2 dBm for 1 dB compression of an S3 signal, frequency offset = 50 kHz.
Third Order Intercept: + 18 dBm.
Noise Floor: -132 dBm @ 2.4 kHz BW.
Squelch Sensitivity: Less than .6 uV.
Receiver Recovery Time: Less than 27 ms.
Receiver Offset Tuning Range: ± 99.9 kHz.
Pass Band Tuning I-F Shift: ± 1.2 kHz.
Audio Output: 1.5 watts @ 8 ohms.
Notch Filter: 250 to 2.2 kHz, greater than 50 dB notch depth.
Audio Bandpass Filter: 4 pole, variable center frequency 220 to 1.7 kHz, 35% bandwidth @ -6 dB.
Tone Control: Variable 15 dB rolloff @ 5 kHz.

PARAGON/OMNI V ACCESSORIES

SPEAKER/POWER SUPPLY

Designed for use with any Ten-Tec 100 watt rig. This highly regulated and very well filtered power supply uses 105 to 125 or 210 to 250 Vac 50/60 Hz, primary power, fuse protected. The output voltage is adjustable from 11.5 to 15 Vdc, factory adjusted to 13.8 Vdc and "over-voltage" protection is incorporated. Regulation is better than 3%, from "no load" to "full load." A re-setting, electronic latching circuit breaker limits current for the protection of the power amplifier and is adjustable. Maximum load is 22 A. Ripple is less than 20 mV peak-to-peak at 20 A. The front panel mounted speaker is a ceramic magnet dynamic, 8 Ohm. The dc output cable is terminated into a 4 pin AMP MATE-N-LOC® which connects to any Ten-Tec transceiver. Two rear panel phono jacks may be used to supply dc to low power accessories.
Size: HWD 5.25" x 7.5" x 13.5" (13.3 x 19 x 34.3 cm).
Weight: 18 lbs. (8.2 Kg).

Model 961, Speaker/Power Supply

Model 256, FM Board.

This easily installed module adds FM transmit and receive capability. System bandwidth is 5 kHz.

Model 257, Voice Synthesizer Board.

This plug-in board announces the frequency displayed when the VOICE button is pressed.

Model 259, Universal ALC Annunciator.

This is great for the vision impaired operators and can be installed in any transceiver with ALC. When the mic gain is advanced to the proper level, a beep sounds.

The DELTA II Model 536

The Delta II is a full featured transceiver designed for base, mobile or portable operation. Simplified all mode operation without compromising performance! Synthesized PLL design provides general coverage from 100 kHz to 30 MHz. Our unique new Jones I-F filter system (patent pending) is standard equipment. This is an eight pole crystal ladder filter design with a continuously variable bandwidth from 500 Hz to 2.4 kHz. Outstanding selectivity that is operator optimized for ssb, cw or the digital modes. Passband tuning is digitally controlled, variable ±–2.5 kHz. Standard AM and FM filters are mode selected. The Delta II delivers outstanding receiver performance, in the ham bands or anywhere in between.

The transmitter power is continuously variable from 100 watts to less than 20 watts output. Superb ssb performance with front panel adjustment of the "set and forget" VOX gain, delay and anti-VOX controls using our new "soft touch" control system. Noise blanker, speech processor and the FM transceive mode are all standard features.

QSK cw performance and a keyed wave from that will embarrass some big rigs (not ours) costing several times more. Independent, ±–1.27 kHz, offset tuning that tracks when using the main frequency tuning control. Cw sidetone with variable pitch and volume. Push-button activated reference tone is used to net another cw signal, exactly.

Rear panel connections are provided for amplifier control, audio in and out, cw key, PTT, band information and remote control interface.

Dual VFOs with A = B, A/B and SPLIT. In SPLIT, use the momentary REVerse button to receive on the transmit VFO to "pick and set" your transmit frequency. This feature allows strategic positioning in a pile-up. Frequency is entered with the numeric key pad or tuned with UP/DOWN buttons in 100 kHz or 1MHz steps. Use the FUNCTION-UP/DOWN buttons to scroll through the 9 ham bands.

Other features include variable tuning rates from 10 Hz to 500 Hz, selected with FAST button and mode. Thirty-one memories. Ten of the memories can be programmed for split frequencies. Scratch pad for temporary storage of frequency and mode, with single button recall. Memory recall by channel number or using memory tune.

The LCD display panel holds contrast, even in direct sunlight. Frequency, VFO status, mode, memory channel, 24 hour clock, receive offset frequency and multi-function bar-graph meter are all an integral part of the display. Back lighting is provided with an electro-luminescent panel which may be turned on/off.

The Delta II is built to travel. At the same time, modern technology has been applied to deliver "big rig" performance and reliability. All you need to add is a source of 12 Vdc and an antenna.

GENERAL SPECIFICATIONS

Frequency Coverage: Transmit all ham bands, 160 through 10 meters. Receive 100 kHz to 29.999.99 MHz.
Frequency Control and Read-Out: Microprocessor controlled, digital phase locked loop synthesizer. 10 Hz resolution.
Frequency Accuracy: ±–100 Hz @ 25 degrees C.
Frequency Stability: Worse case, 1 PPM per degree, 0-50 C.
Dual VFO Control System: A/B selects A or B VFO. A = B nets both VFOs to mode and frequency. SPLIT allows independent transmit/receive frequency control. REVerse momentarily switches to opposite VFO to listen to or set transmit frequency when operating SPLIT. Can operate cross band and mode.
VFO Tuning Rates: 10 Hz or 50 Hz selectable with FAST button in ssb or cw. 100 Hz or 500 Hz in FM or AM modes.
Memory System: Non-volatile RAM. 31 total. 10 may be programmed for split frequency combinations. Store by channel number or random to an available channel. Recall by channel number or select using memory tune function.
Display: Liquid crystal. Electro-luminescent back lighted panel with on/off switch.
Dial Lock: Adjustable drag.
RS-232 via ⅛" mini jack.
Rear Panel Connections: DIN connector A; band information. DIN connector B; fixed level audio in/out, PTT, TX EN/TX OUT, QSK amplifier control, mic mute (use with AFSK), amplifier control line (non-QSK), foot switch (mutes speaker and activates "T" line) and ground. Separate jacks for external speaker, cw key, AUX 13.5 Vdc and a thermostatically controlled dc line for external cooling for "key-down" modes.
Primary Power: 11 to 14.5 Vdc @ 20 A.
Antenna Impedance: 50 Ohms, unbalanced.
Printed Circuit Boards: G-10 epoxy glass.
Dimensions: HWD 3.75" x 9.75" x 14.0" overall. (9.53 x 24.8 x 35.6 cm).
Net Weight: 10 lbs, 10 oz. (4.82 kg).

TRANSMITTER

Modes: LSB, USB, CW, FM. Digital modes using externally generated AFSK. **AM transmit not provided.**
RF Output: Continuously variable, using front panel control, from 100 watts to less than 20 watts.
Microphone Input: 250 to 50,000 Ohms, dc bias voltage for electret element provided.
CW Sidetone: Internally generated, adjustable volume, using front panel "soft touch" system, independent of receiver volume control. Tone frequency internally adjustable.
SSB Generation: Double sideband modulator. 8 pole crystal ladder filter.
Carrier Suppression: Greater than 60 dB.
Unwanted Sideband Suppression: Greater than 50 dB @ 1.5 kHz AF input.
Harmonic Emissions: Greater than 45 dB below peak power output.
Spurious Output: Greater than 50 dB below peak power output.
Third Order Intermod Products: –30 dB from two tone at 100 watts output.
Metering: Forward power, SWR in transmit. S-meter in receive. Indicates control settings in "soft touch" adjust mode.
CW Offset: Factory preset 500 Hz, field programmable.
VOX System: VOX gain, delay and anti-VOX are front panel adjustable using our "soft touch" control system.

RECEIVER

Modes: USB, LSB, CW, FM, AM and digital modes.
Sensitivity:

Mode	.1 to 1.6 MHz	1.6 to 29.999.99 MHz
SSB/CW/AFSK	.5 uV	.25 uV
AM	3.5 uV	1.00 uV
FM	1.0 uV	.30 uV

Selectivity: 8 pole, crystal ladder I-F filter with continuously variable band-width, from 500 Hz to 2.4 kHz, used in cw, ssb and digital modes. FM and AM modes automatically select built-in filters.
Attenuator: –20 dB, .1 to 29.999 MHz.
I-F Frequencies: 1st = 45 MHz, 2nd = 6.144 MHz. (FM mode 3rd = 455 kHz).
Image Rejection: Greater than 80 dB.
I-F Rejection: Greater than 70 dB.
Noise Blanker: Switchable, ON/OFF.
Dynamic Range: 95 dB, typical.
Noise Floor: –129 dBm. (.25 uV for + 10 dB s/n in ssb)
Squelch Sensitivity: Less than .6 uV.
Receiver Recovery Time: Less than 27 ms.
Receiver Offset w/RXO Control: ±–1.27 kHz with digital display.
Passband Tuning: Digitally controlled, ±–2.5 kHz.
BFO: Digitally controlled, phase locked loop.
Audio Output: 1.5 watts @ 8 Ohms, less than 2% THD.
Notch Filter: .250 to 2.2 kHz, greater than 50 dB notch depth.

Specifications subject to change.

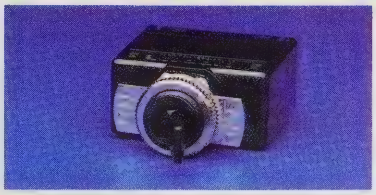
AVAILABLE NOVEMBER 1990

DELTA II/ARGONAUT II ACCESSORIES

Model 936.
Portable power supply for the Delta II. Output is adjustable from 11.5 to 15 Vdc, factory set for 13.8 Vdc. Adjustable electronic current trip circuit, 22 amps max. Primary power switchable for 105/125 Vac or 210/250 Vac, 50 - 60 Hz, fused. DC output into a 5 foot, 2 conductor #14 cable terminated in a 2 conductor AMP Mate-N-Lock connector which mates with the Delta II dc input connector. Two AUX dc outputs through RCA phono jacks for low power accessories.
Size: HWD 3¾" x 5½" x 12".
Weight: 18 lbs.

MODEL 290, STEP ATTENUATOR.
Reduces pass-through power in six, switch selected, calibrated steps from five watts to 10 mw. A great accessory for the Argonaut II and the true QRP experimenter.

UNIVERSAL ACCESSORIES



CIRCUIT BREAKER
1140 DC Models 546/560/561/562/580/585.

The ARGONAUT II Model 535

The Argonaut II adds a new dimension to QRP transceiver operation—world class receiver performance! The fully synthesized PLL design provides general coverage from 100 kHz to 30 MHz. Our unique new Jones I-F filter system (patent pending) is standard equipment. This is an eight pole crystal ladder filter design with a continuously variable band-width, from 500 Hz to 2.4 kHz. Outstanding selectivity that is operator optimized for ssb, cw or the digital modes. Passband tuning is digitally controlled, variable ±-2.5 kHz. Standard filters for AM or FM reception are mode selected. The Argonaut II delivers outstanding receiver performance, in the ham bands or anywhere in between.

The transmitter power is continuously variable from one-half watt to 5 watts output. Accessory attenuator provides accurate output power control to a fraction of one watt. Superb ssb performance with front panel adjustment of the "set and forget" VOX gain, delay and anti-VOX controls using our new "soft touch" control system. Noise blanker, speech processor and the FM transceive mode are all standard equipment.

QSK cw performance and a keyed wave form that will embarrass some big rigs (not ours) costing several times as much. Independent, ±-1.27 kHz, offset tuning that tracks when using the main frequency tuning control. Cw sidetone with variable pitch and volume. A reference tone can be keyed for "zeroing" a cw signal exactly.

Dual VFO's with A = B, A/B and SPLIT. In SPLIT, use the momentary REVerse button to listen to the transmit VFO to "pick and set" your transmit frequency. This feature allows strategic positioning in a pile-up. Frequency is entered with the numeric key pad or tuned with UP/DOWN buttons in 100 kHz or 1 MHz steps. Use the FUNCTION-UP/DOWN buttons to scroll through the ham bands.

Other features include variable tuning rates from 10 Hz to 500 Hz, selected with FAST/SLOW button and/or mode. Thirty-one memories. Ten of the memories can be programmed for split frequencies. Scratch pad for temporary storage of frequency and mode, with single button recall. Memory recall by channel number or using memory tune.

The Argonaut II is designed for base station, mobile or portable use. Energy efficient for practical battery operation. Operates on 12/14 Vdc or 12/14 Vac using a wall transformer. The LCD display panel shows frequency, VFO status, mode, memory channel, 24 hour clock and multi-function bar-graph meter. Back lighting is provided with an electro-luminescent panel which may be turned on/off.

The Argonaut II is the result of research within the QRP community. Many of the features are the direct result of feedback from the QRP "Gurus," worldwide. All of the transceiver features are standard equipment. We are proud of our QRP heritage and we think this pride shows in the Argonaut II.

GENERAL SPECIFICATIONS

Frequency Coverage: Transmit all ham bands, 160 through 10 meters. Receive 100 kHz to 29.999.99 MHz.
Frequency Control and Read-Out: Microprocessor controlled, digital phase locked loop synthesizer. 10 Hz resolution.
Frequency Accuracy: ±-100 Hz @ 25 degrees C.
Dual VFO Control System: A/B selects A or B VFO. A = B nets both VFOs to mode and frequency. SPLIT allows independent transmit/receive frequency control. REVerse momentarily switches to opposite VFO to listen to or set transmit frequency when operating SPLIT. Can operate cross band and mode.
VFO Tuning Rates: 10 Hz or 50 Hz selectable with FAST button in ssb or cw. 100 Hz or 500 Hz in FM or AM (receive only) modes.
Memory System: Non-volatile RAM. 31 total. 10 may be programmed for split frequency combinations. Store by channel number or random to an available channel. Recall by channel number or select using memory tune function.
Frequency Stability: Worse case, 1 PPM per degree C @ 25 degrees C.
Display: Liquid crystal. Electro-luminescent back lighted panel with on/off switch.
Primary Power: 12/14 Vdc or Vac. Filter, rectifier and current regulator, built-in. Can be operated with a 12/14 Vac transformer.
Antenna Impedance: 50 Ohms, unbalanced.
Printed Circuit Boards: G-10 epoxy glass.
Dimensions: HWD 3.75" x 9.75" x 12.5" overall. (9.5 x 24.8 x 31.7 cm).
Net Weight: 8 lbs, 10 oz. (3.91 kg).

TRANSMITTER

Modes: LSB, USB, CW, FM. Digital modes using externally generated AFSK. AM transmit not provided.
RF Output: Continuously variable, using front panel control, from 5 watts to approximately .5 watt.
Microphone Input: 250 to 50,000 Ohms, dc bias voltage for electret element provided.
CW Sidetone: Internally generated, adjustable volume independent of receiver volume control. Tone frequency internally adjustable.
SSB Generation: Double sideband modulator. 8 pole crystal ladder filter.
Carrier Suppression: Greater than 60 dB.
Unwanted Sideband Suppression: Greater than 50 dB @ 1.5 kHz AF input.
Harmonic Emissions: Greater than 45 dB below peak power output.
Spurious Output: Greater than 50 dB below peak power output.
Third Order Intermod Products: -30 dB from two tone at 5 watts output.
Metering: Forward power, SWR in transmit. S-meter in receive. In the "soft touch" adjust mode, the meter scale is used to display VOX gain, anti-VOX and other control settings.
CW Offset: Factory preset 500 Hz, field programmable.
VOX System: VOX gain, delay and anti-VOX are front panel adjustable using our "soft touch" control system.

RECEIVER

Modes: USB, LSB, CW, FM, AM and digital modes.
Sensitivity:

Mode	.1 to 1.6 MHz	1.6 to 29.999.99 MHz
SSB/CW/AFSK	.5 uV	.25 uV
AM	3.5 uV	1.00 uV
FM	1.0 uV	.30 uV

Selectivity: 8 pole, crystal ladder I-F filter with continuously variable band-width, from 500 Hz to 2.4 kHz, used in cw and ssb (also digital) modes. FM and AM modes automatically select built-in fixed band-width filters.
Attenuator: -20 dB, .1 to 29.999 MHz.
I-F Frequencies: 1st = 45 MHz, 2nd = 6.144 MHz. (FM mode 3rd = 455 kHz).
Image Rejection: Greater than 80 dB.
I-F Rejection: Greater than 70 dB.
Noise Blanker: Switchable, ON/OFF.
Dynamic Range: 95 dB, typical.
Noise Floor: -129 dBm. (.25 uV for + 10 dB s/n in ssb)
Squelch Sensitivity: Less than .6 uV.
Receiver Recovery Time: Less than 27 ms.
Receiver Offset w/RXO Control: ±-1.27 kHz with digital display.
Passband Tuning: Digitally controlled, ±-2.5 kHz.
BFO: Digitally controlled, phase locked loop.
Audio Output: 1.5 watts @ 8 Ohms, less than 2% THD.
Notch Filter: .250 to 2.2 kHz, greater than 50 dB notch depth.

Specifications subject to change.

AVAILABLE OCTOBER 1990

Model 604 Electronic Iambic Keyer.
Unique torque driven paddles and adjustable magnetic tensioning system for the ultimate "touch" control. Front panel adjustment of speed and weighting. A cw operator's delight.

Model 605 Single Paddle Electronic Keyer.
Operation is just like a "bug" except the dashes are also keyed automatically. Adjustable paddle tension, speed and weighting. Also great for mobile use.

Model 606.
Single paddle electronic keyer designed for battery power, using a Curtis chip. Adjustable paddle travel and tension. Speed and weighting front panel adjustable. Small size, energy efficiency and rugged paddle construction make this model the ideal traveller.

MICROPHONES FOR USE WITH ANY MODEL WITH A 4-PIN MIC CONNECTOR
700C Hand mic, electret w/coiled cord and connector.
705 Desk mic, electret with cord and connector.

The HERCULES II, Solid State Kw Linear Amplifier Model 420

High tech simplicity, base or mobile. A compact, lightweight HF amplifier that offers a unique combination of virtues that can only be achieved using modern, solid state technology. Instant on, 12 - 14 Vdc operation, general coverage from 160 through 10 meters, no-tune operation and compact size. Add to that, lightning fast QSK cw, remote control, superb linearity and a low drive requirement. Outstanding!

The Hercules II is attractively styled to match our HF base station transceivers and will interface nicely with virtually all transceivers. The front panel includes an analog multi-meter for collector current, voltage, forward power and SWR. A ten element LED bargraph instantaneously displays peak power output. Band selection is either with the front panel switch or remotely via a rear panel connector. A front panel speaker is built in.

The internal heat sinks are air cooled by a temperature controlled tube axial fan. Whisper quiet in ssb operation, yet enough air capacity for cool operation in the key-down modes. The Hercules II is compact, good looking and generates a signal that is within one S-unit of the mighty Titan.

MODEL 9420 115/230 VAC POWER SUPPLY

Housed in a separate utility enclosure and remotely controlled through the 6 foot power cable. 100 amperes at 13.7 Vdc is provided. 80 amperes for the amplifier and 20 amps for the exciter. An alternate power supply can be a heavy duty, deep cycle, lead acid battery and an automatic 10 amp charger. This low cost alternative power source will support the Hercules II during sustained amateur service.

EXTENSION CABLE FOR REMOTE CONTROL, MODEL 300.

Twelve foot extension cable for use with the Model 9423 remote control. Terminated at both ends for quick installation.

REMOTE CONTROL HEAD MODEL 9423.

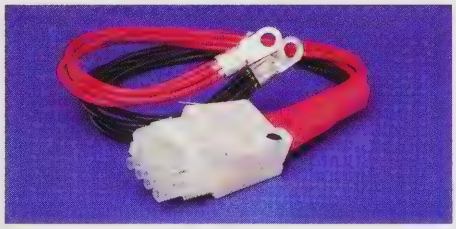
For mobile installations with the Hercules II remotely mounted. Compact size (HWD 1.5″ x 6.25″ x 4″) allows the remote head to be installed at the transceiver. Functions include ON/OFF, QSK or VOX/PTT control, band select with band indicator LEDs, 10 element LED peak power display and "FAULT" indicator. Unit includes mounting bracket and 12 ft. cable, terminated to plug into the Hercules II rear panel remote control connector. For longer cable runs, order Model 300, 12 ft. extension cable.

MODEL 264.

A combination "Y" (Molex connectors) and 4 ft. extension cable for adding a second device to the automatic band select information line. This cable required, in addition to the Model 236, if both the Hercules II and Model 253 automatic tuner are used.

MODEL 9422 DC CABLE.

Model 9422 DC power adaptor cable for mobile or fixed station battery power. 14″ length with 12 pin Molex that connects to the amplifier and heavy terminal lugs for positive and negative battery connection.



MODEL 236.

A combination "Y" (25 pin "D" connectors) and 4 ft. extension cable for connecting the Hercules II for remote control from a Paragon or Omni V transceiver. Provides a second 25 pin "D" connector for connection of second device such as a computer or the Model 301 remote frequency tuning encoder (Omni V only) to the transceiver.

Titan, HF Linear Amplifier, Model 425

The Tital has it all! Maximum legal power with ease, all full power bands 160 through 15 meters (10 and 12 meters after authorized modification), lightning fast QSK for break-in cw and the digital modes and a two speed blower for quiet operation. This awesome performance from a desk top amplifier is made possible by the remote power supply and a pair of Eimac® 3CX800A7 ceramic triodes. The heart of the power supply is our own four core, tape wound Hypersil® transformer. This 41 lb behemoth is conservatively rated at 2.5 kVa CCS (9.2 kVa IVS) and is nearly noiseless, even at 1500 watts output!

Other features include a front panel, peak reading wattmeter using an instantaneous ten element LED bargraph display. PTT/VOX or QSK control line select switch, built-in SWR meter and an "over-drive" warning LED. 3:1 vernier TUNE and LOAD controls in combination with an outstanding RF deck design, make the Titan a real "pussy cat" to load and operate.

The Titan is styled to match our transceivers but it interfaces beautifully, no matter what exciter you are using. If you are ready to choose your dream amplifier, the Titan has it all! Check it out.

TEN-TEC

The CENTURION, HF Linear Amplifier Model 422

The Model 422 Centurion uses the classic pair of Eimac® 3-500Z tubes. The RF deck and power supply are combined into a single, attractively styled, desk top cabinet. The power output is rated at 1300 watts on ssb, 1000 watts cw and 650 watts using "key-down" modes. Drive required for full power ssb operation is 100 watts. The duty cycle is 50%.

QSK cw is achieved using relay switching and the proven T/R circuit from the Hercules II. This circuit also makes the Centurion ideal for fast switching digital modes. VOX ssb is silky smooth and virtually noiseless. This versatile control system assures compatibility with all exciters with amplifier control provisions.

A tube-axial fan is used for forced air cooling. Air flow is routed through the power supply as well as the upper and lower sections of the RF compartment. Air inlets and outlets are in the sides and top of the cabinet to optimize low pressure, low noise, air movement.

A dedicated meter for plate current, a multi-meter for plate voltage, grid current and forward or reflected power. A full time 10 element LED bargraph instantly displays peak power output.

The Centurion operates on all bands from 1.8 to 21.5 MHz. 21.5 to 29.7 MHz is enabled with the installation of an expansion board, supplied no-charge upon proof of licensed authority.

A tough, easy to handle, amplifier that doesn't really mind a little abuse. The Centurion is a great value.

SPECIFICATIONS

Band Coverage: 1.8-2.0, 3.2-4.7, 6.5-10.3, 13.4-19.6, 17.6-21.5 MHz. 21.5-29.7 MHz after authorized modification.
Input Power: 2000 watts, maximum.
Power Output: 1300 watts ssb, 1000 watts cw. RTTY and SSTV 650 watts, 50% duty cycle.
Drive Power: 100 watts for full rated output.
Efficiency: 50-65%, depending on frequency and load impedance.
Input/Output Impedances: 50 Ohms, unbalanced. SWR ◄2:1.
Distortion: –35 dB from 1 kw rf output level.
Harmonics: –50 dB typical.
CW Break-In: QSK capable. Relay switching.
Tube Compliment: Two Eimac® 3-500Z.
Power Amplifier Circuit: Class AB2, grounded grid.
Plate Voltage: 3100 volts, no load. 2600 volts, full load.
Cooling: Forced air with full chassis air flow.
Metering: Dedicated plate current meter. Selectable multi-meter for plate voltage, grid current, forward or reflected power. Ten element LED bargraph display for peak power indication.
Front Panel Status Indicators: Standby, operate, transmit.
Primary Power: 220-250 Vac @ 15 A. 110-125 Vac @ 30 A, 50/60 Hz. For full power operation, 220-250 Vac is strongly recommended.
Circuit Protection: Primary line fuses. Plate transformer primary interlock and high voltage shorting bar.
Front Panel Controls: Power on/off, standby/operate, control mode select (QSK - PTT/VOX), plate TUNE and LOAD, band switch, meter switch.
Tune and Load Controls: 6:1 vernier drives with calibrated dial skirts.
Construction: Aluminum chassis, front and rear panels, interior partitions and top and bottom covers.
Size: HWS 8.25″ x 15.25″ x 18.5″. (20.3 x 38.7 x 46.9 cm).
Weight: 47 lbs (21.3 kg).

OUR BEST FEATURE

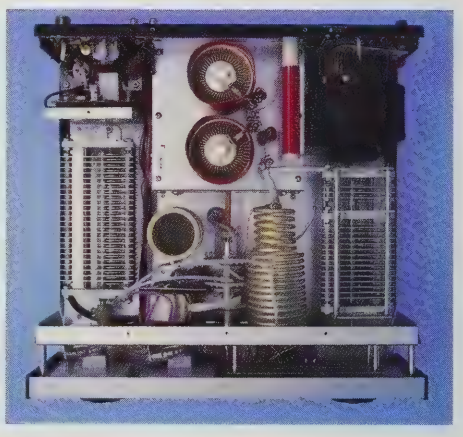
is one you may never use. Our service and product support are legendary. Proven, not just claimed! All of our products are designed for field service to the board level. When you call us with a service need, you typically talk to one of the techs who services the model you own. Many times service can be accomplished with a "pain-less" mail order board exchange. If factory service is required, the work is thorough, fast and at a fair charge.

SPECIFICATIONS

Frequency Coverage: 1.8-2.0, 3.2-4.7, 6.5-8.5, 13.4-19.6, 17.6-23.0. With 10 meter modification, 17.6-26.5, 20.6-31 MHz.
Drive Power: 65 to 80 watts typical for 1500 watts output.
Efficiency: 50-65% depending on frequency, drive level and load.
Distortion: –35 dB from 1 KW RF output level.
Harmonics: –50 dB typical.
Input and Output Impedance: 50 Ohms.
Transmit/Receive Control: Provision for PTT or QSK control lines, front panel selectable. T/R switching uses a Jennings® vacuum relay. RF sensing circuit prevents keying or un-keying if 10 mW of RF present on the RF drive line. Switching time less than 8 ms.
Tube Complement: Two Eimac® 3CX800A7 ceramic, external anode triodes in a grounded grid circuit. Total plate dissipation, 1600 watts.
Plate Voltage: 2400 Vdc, no load.
Over-Drive Protection: A front panel warning light turns on when grid current reaches the allowable limit. At the same time, the grid current limiting circuit takes over to protect the PA tubes.
Cooling: Ducted forced air, vertical exhaust, using a two speed centrifugal blower.
Metering: Full time plate current. Switch selected plate voltage, grid current, forward power or reflected power. Peak power is indicated on a 10 element LED bargraph display. The first nine elements are green—the tenth LED is red and indicates 1500 watts output.
ALC: Negative-going, adjustable threshold.
LED Status Indicators: Overdrive, Standby, Wait, Operate.
Primary Power: 220-250 Vac at 20 A, maximum. 117 Vac operation is possible but not recommended.
Protection: Primary line fuses, plate current fuse, ac line and high voltage interlocks.
Front Panel Controls: Power ON-OFF, STANDBY-OPERATE, selectable control lines VOX/PTT or QSK, Plate TUNE and LOAD controls, BAND Switch, METER Switch.
Size: RF deck, HWD 5.25″ x 15.25″ x 15″. (13.3 x 38.7 x 76.8 cm). Power supply, HWD 8.25″ x 13.4″ x 10.25″. (21 x 34 x 60 cm).
Weight: RF deck, 17 lbs, (7.7 kg). Power supply, 50 lbs, (20.5 kg).

UPS shippable, factory packaged in three cartons; RF deck, power supply w/o power transformer, power transformer.

The Titan is backed by a 3-year limited warranty.



RF Deck

Two Kw, Automatic HF Antenna Coupler Model 253

The ultimate convenience for the station that does not have a world class antenna system, or for the all mode operator who doesn't have the antenna bandwidth required to cover the bands from top to bottom. All you do is provide the Model 253 with 50 watts of tune signal, press the TUNE button, and within seconds your antenna is matched to the transmitter and ready for full power operation. Pretty neat, eh!

The Model 253 also functions as a desk top antenna management system. Provision is made to connect four separate antennas which are selectable from the front panel of the coupler. The fourth antenna position can be configured for a long-wire, balanced feeders using the built-in hi-power balun, or another coaxially fed antenna.

The same silver plated high power roller inductor used in our reliable, time proven, manual tuners is incorporated into the 253. The inductor is driven by a 12 vdc stepping motor. Fixed capacitor values are quickly evaluated and selected with long life, enclosed, relays. Two high speed, high voltage and low loss, vacuum relays are used to switch the tuner into and out of the circuit.

The tuning routine is controlled by an on-board computer. A memory is provided for each of the four antenna positions that recalls the computer derived settings last used with that antenna switch position. If band switching information is provided by the transceiver, (like the Ten-Tec Paragon, with the optional RS-232 board, and Omni V) one memory is available for each of seven bands at each antenna switch position. If the Ten-Tec Hercules II amplifier is used, the entire station is automatically controlled by the Ten-Tec transceiver. When the memories are used, tune-up is almost instantaneous. Front panel switches are provided for manual over-ride of the automatic system, in case you think you are "smarter" than the on-board computer.

The Model 253 is performance competitive with commercial and military antenna couplers costing many times more. We think that this new product is an example of American ingenuity at its best.

SPECIFICATIONS

Circuit Type: Reversible "L" network.
RF Power Rating: 2 KW maximum.
Frequency Range: 1.8 to 30 MHz.
Input Impedance: 50 Ohms, nominal.
DC Power Input: 12-14 volts, 2 amps maximum.
Size: HWD 5.5 x 14 x 10.5" (138 x 356 x 267mm).
Weight: 9 lbs 9 oz (4.34 Kg).

Tuning Accuracy: 1.5:1 VSWR maximum after tuning, 2.5:1 VSWR maximum during tuning.
Automatic Tuning Time: 5 seconds typical, 30 seconds maximum (from home position).
Manual Tuning: Full range manual tuning available via front panel up/down switches.
Memory Tuning: Tuner automatically returns to settings last used for each antenna switch position. Separate settings are stored for each band if remote band connector is used. Retuning (auto or manual) updates memory.
Tune Power: 50 Watts minimum, 150 Watts maximum. Radiated power at least 6dB below input during tuning.
Antenna Switch: 4 position. Position 4 configurable for coax, single wire, or balanced line feed. Internal balun standard.
Output Matching Range: At least 10:1 VSWR, any phase angle, 1.8 to 30 MHz. 1300 Ohms maximum parallel equivalent resistance at 1500 Watts output (2 KV peak, ►26:1 VSWR). 5000 Ohms maximum parallel equivalent resistance across balanced line at 1500 Watts output (4 KV peak).
Minimum Full Power Longwire Length: Single wire feed: 180/F (MHz) feet at 1500 watts out.
Arcing Protection: "ARC" indicator illuminates when RF voltage exceeds 2 KV. Tuner is reset to bypass mode if arc indication remains for 1 second.

ANTENNA TUNER, MODEL 254 RATED AT 200 WATTS

The Model 254 antenna tuner is a compact, lightweight design that will match a variety of balanced or unbalanced antenna feedlines to the 50 Ohm output of an HF transceiver. A unique, Ten-Tec designed, tapped inductor is wound on a 2 inch diameter powdered iron core with provisions for 47 positions on the inductor selection control. Two open air variable capacitors match the input and output of the "T" network. This tuner is ideal for base or portable operation. It also is very effective as a mobile tuner for extending the useable frequency range of a resonant mobile antenna. An SWR metering system is incorporated with meter scales of 0-20 and 0-200 watts. The meter can be illuminated with an external 12 - 14 Vdc source.

SPECIFICATIONS

- 200 watts continuous power input.
- Silver plated 18 gauge inductor, wound on a 2 inch diameter powdered iron "donut." Forty seven position rotary tap selects inductance value.
- Two variable capacitors tune input and output. Rated at 1000 volts each.
- Frequency range 1.8 to 30 MHz.
- Powdered iron core balun is built in for balanced feeders.
- Rear panel input and outputs through SO-239 UHF connectors for coaxial lines. Terminal posts for long wire or balanced feedline type antennas and for ground. Front panel switch selects any of four antennas or the "by-pass" position.
- Meter scales for 0-20 and 0-200 watts. External 12 - 14 Vdc required for meter light. Rear panel connector provided.
- Size: HWD 3.5" x 8.75" x 8.5" (8.9 x 22 x 21.6 cm).
- Weight: 4 lbs 3 oz (1.9 kg).

MODEL 291 PORTABLE/MOBILE 200 WATT TUNER

The same "T" match circuit as the Model 254. Rear panel post for connecting a long wire and a SO-239 connector for a coax fed antenna. Uses the metering in your transceiver for tuning. Small, rugged, lightweight and easy to operate. Ideal for the "knock-about" world of portable or mobile operation.

KW DRY DUMMY LOAD MODEL 240KW

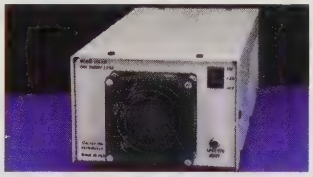
This forced air cooled dummy load is designed to operate at 1500 watts "key down" for up to two minutes, in the 1.5 to 150 MHz frequency range. It is ideal for tuning and testing high power transmitting equipment without radiating significant signal levels. A built-in probe provides a signal sample for evaluation, at the panel mounted MONITOR jack. An alarm sounds if load temperature exceeds the allowable limit. The load is provided by two, 100 Ohm 750 watt, ceramic resistors, connected in parallel. These specially designed resistors are chemically inert and temperature stable.

SPECIFICATIONS

Impedance: 50 Ohms.
Typical VSWR: 1.5 to 30 MHz ∓ 1.2:1. 30 to 150 MHz = 1.5:1.
Power Ratings:

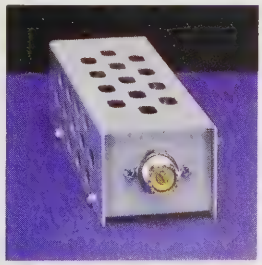
1500 watts	2:00 minutes
1000 watts	2:45 minutes
750 watts	4:30 minutes
500 watts	7:30 minutes
300 watts	continuous

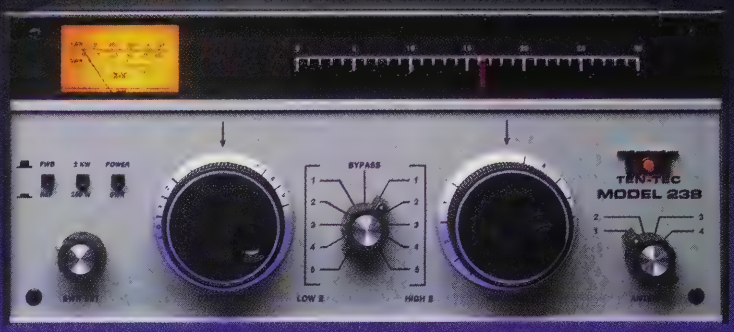
RF Input Connector: SO-239, UHF type.
Fan and Alarm Power: 10 - 14 Vdc.
Size: HWD 4.5" x 6" x 13" (11.5 x 15.25 x 33 cm).
Weight: 6 lbs 6 oz (3 kg).



BROADBAND DUMMY LOAD MODEL 239

160 through 2 meters with 1:1 SWR. Through 70 cm below 2:1 SWR. 300 watts intermittent duty.





Full Power, Full Featured Manual Tuners Model 238

Model 238. The latest version of our tried and true "L" match design. This circuit is preferred among experts in the field because of its ability to match a broad range of impedances without the risk of self-resonance. All adjustments use calibrated scales for logging and a quick return to the same frequency and antenna. Rear panel fittings for four antennas. Three are dedicated for coax feedlines. The fourth can be coax, single wire or balanced feeders using the built-in high power balun. All are front panel selectable. Multi-meter (illuminated with external 12 Vdc) displays forward power in 0 - 200 and 0 - 2000 watt scales and SWR. The Model 238 is a great way to match broad operating interests to narrow-band or non-resonant antennas.

SPECIFICATIONS

Circuit: Modified "L" network.
Maximum RF Power: 2 kw with a load impedance of 3000 Ohms.
Frequency Range: 1.8 to 20 MHz.
Output Matching Range: At least 10:1 SWR, any phase angle.
Maximum Impedance, Balanced Feedline: 500 Ohms.
Input Impedance: 50 Ohms.
Input/Output Connectors: Input and four antenna coax connectors are SO-239, UHF type. Studs with wing nuts for single wire and balanced feeders.
Variable Capacitor Voltage Rating: 3.5 kV.
Inductance: 28 uH silver plated roller inductor.
Size: HWD 5.5" x 13" x 11". (13.9 x 33 x 27.9 cm).
Weight: 9 lbs (4.1 kg).

For the Builder...

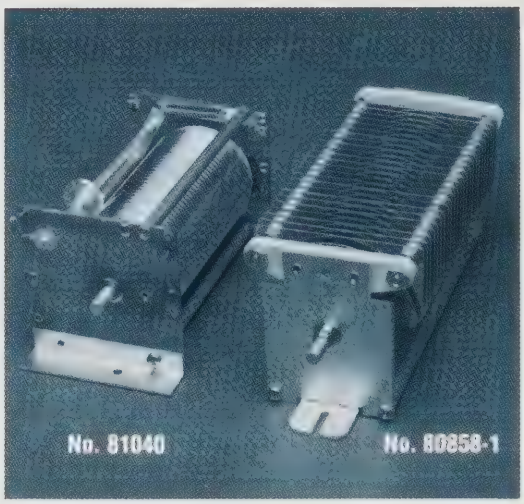
HARD TO FIND TUNER/AMPLIFIER COMPONENTS

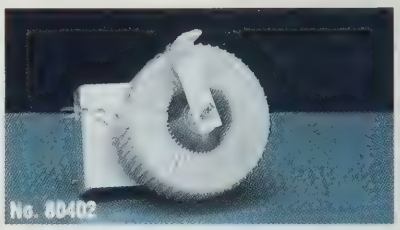
Roller inductor, as used in our Model 238 antenna coupler, kilowatt rated with silver plated wire wound on solid coil form. Excellent roller and rotary inductor mechanical design for years of trouble free service. Inductance variable from .1 to 19 uH. Part number 81040.

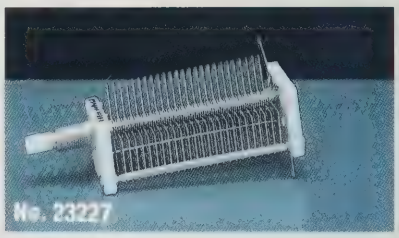
Kilowatt variable capacitor, as used in the Titan amplifier and Model 238 antenna coupler. Variable from 40 to 500 pF at 3.5 kv. Part number 80858-1.

Tapped inductor wound on a powdered iron core, as used in our Model 254, 200 watt antenna coupler. Variable in 47 steps from .1 to 20 uH. Part number 80402.

Variable capacitor, as used in our Model 254, 200 watt antenna coupler. Tuning range is 1 to 207 pF @ 1 kv. Part number 23227.







Consumer Electronics Interference Filters

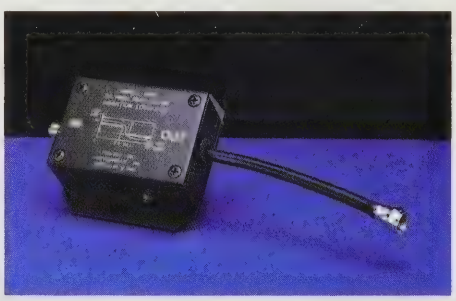
Nothing focuses attention on amateur radio quite like a ripped up TV picture or hi-fi audio that is being substantially destroyed by a single-sideband signal. Finding the cause of the interference can be a challenge that ranks right up there with convincing your family or neighbors that reading a book is more fun than watching TV. The successful approach is to eliminate possibilities one at a time. The first step is a quality low pass filter in your transmission line. The second step is to install an effective high pass filter at the TV/FM receiver.

LOW PASS, 2 KW COAXIAL LINE FILTER MODEL 5061.

This is a 9th order, Chebyshev circuit, with less than 0.2 dB of loss within the passband. 50 dB attentuation at 50 MHz, with 70 dB ultimate, attenuation in the stopband. Unlimited operation at 1500 watts at up to 2:1 SWR. Rugged extruded aluminum housing with SO-239 UHF input/output connectors.

HIGH PASS TV/FM FILTER MODEL 5060.

Forty dB of attenuation below 30 MHz. Insertion loss 2 dB or less. Extruded aluminum case with a female type F chassis connector at one end and a male type F connector on a 4" RG-59 extension at the other end.



The "Closet Kilowatt"...

The ultimate XYL pleaser. The entire station enclosed in a handsome, color matched, cabinet measuring 19″ high x 21″ wide x 18″ deep. With only the antenna, power and ground as external connections, the station almost even looks like "wireless." The cabinet is all aluminum with sturdy internal reinforcing members and all welded assembly. Light grey baked enamel finish. Recessed hand-holds. This idea may change the entire image of ham radio, at least in the eyes of those that see your shack.

Rack Mount Kits

RM-420 RACK MOUNT KIT
For the Model 420 Hercules II.

RM-425 RACK MOUNT KIT
For the Model 425 Titan.

RM-500 RACK MOUNT KIT
For the Omni V or Paragon.

RM-253 RACK MOUNT KIT
For the Model 253 automatic tuner.

RM-238 RACK MOUNT KIT
For the Model 238 manual tuner.

RM-P0175-19
1.75″ x 19″ blank panel. Use when three Ten-Tec units are mounted.

RM-P0700-19
7″ x 19″ blank panel. Use when Ten-Tec units are mounted.

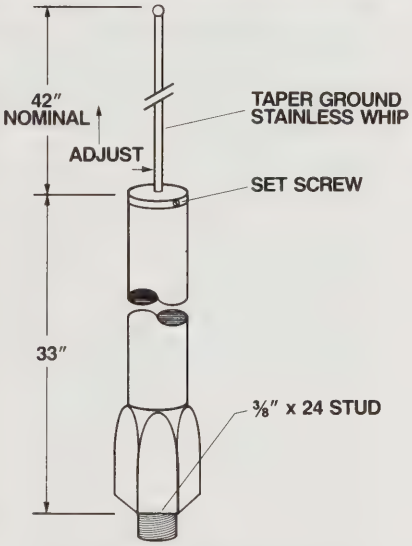
RM-19-1750 CABINET
With panel opening 19″ wide x 17.5″ high.

The Ultimate HF Mobile Antennas

HF mobile operation is a world of compromise under the best conditions. Give yourself a "break" and start with a good antenna system. Our 200 watt, linear loaded design is the best compromise between radiation efficiency and mechanical reality. The loading coil is precision wound on a most durable PVC tube and then weather-protected with a heat shrink jacket. All fittings are chrome plated brass. The taper ground, stainless steel whip is vertically adjustable at the center fitting for "no-tears" tuning. The over-all height of 78″ or less, combined with the low profile design, results in minimum wind load and eliminates the need for a spring, and it clears most over-head obstacles. The no-spring installation results in less tilting and de-tuning. Band identification is permanently stamped into the base fitting. May be used with any mount that accepts a ⅜″ x 24″ stud.

MODEL 3101. 42″ REPLACEMENT WHIP. USE WITH ALL MODELS. (SUPPLIED WITH EACH ANTENNA.)

MODEL 4010. 10 meters
MODEL 4012. 12 meters
MODEL 4015. 15 meters
MODEL 4017. 17 meters
MODEL 4020. 20 meters
MODEL 4030. 30 meters
MODEL 4040. 40 meters
MODEL 4075. 75 meters.
MODEL 4080. 80 meters.



MODEL 293.
Mobile mount. Can be floor or under-dash mounted. Quick-release lever lock-in system.

TEN-TEC

MODEL 3001. MOBILE MATCHER
Mounts at feed point of the antenna mount. Switch selectable fixed value capacitors plus a "bypass" position. Recommended for minimum SWR on 20, 30, 40, 75 and 80 meters.

Equipment Enclosures
And Project Boxes

Since Ten-Tec was founded in 1968, we have been a designer and producer of metal and plastic enclosures. The cabinetry for our own electronic equipment is produced in-house and we are a major supplier of custom enclosures for other equipment manufacturers throughout the United States. Shown below, is a cross section of our catalog line of enclosures. Quality material, quality designs and quality workmanship. The finishing touch for your building efforts.

CONSTRUCTO SERIES B.

Unique in all the world. Variable chassis deck height for design flexibility. Aluminum chassis and panels with steel top and bottom cabinet. Sizes from HWD 2.5″ x 6″ x 5″ to 5.5″ x 12″ x 9″. Blue or Black.

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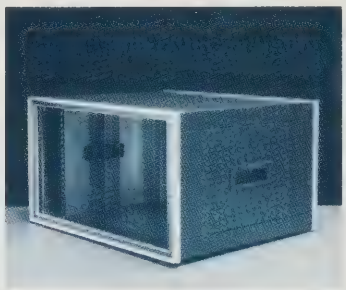

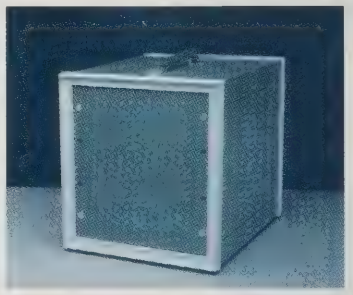

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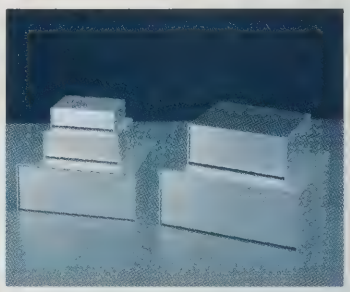

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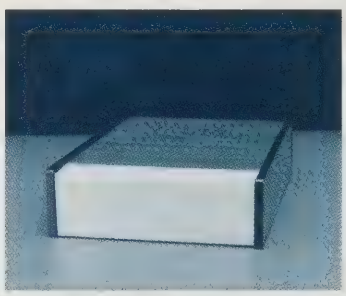

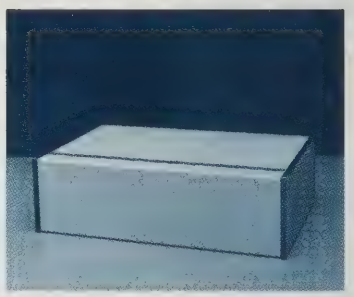

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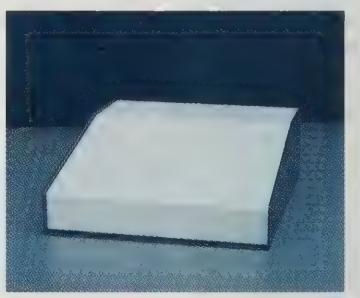

The Ten-Tec Story

All Ten-Tec products are produced in our 40,000 square foot plant located in the foothills of the Great Smoky Mountains. The basic processes are done in-house including the design and manufacture of printed circuit boards, plastic molding, sheet metal fabrication and finishing, and of course electronic assembly and testing. We produce our own tooling in our well equipped tool and die shop. Our development lab and quality control department are exceptionally well staffed and supported by the latest in instrumentation.

We produce custom enclosures for other equipment manufacturers and a standard catalog line of metal enclosures. We produce custom tools and dies for many manufacturers in the region. This unique combination of in-house processes ensures our ability to produce equipment of the highest quality, reliability and value.

We are proud of our reputation for customer service and product support. Our philosophy is that a sale is the beginning of a happy relationship. We provide service on our products that have been discontinued for many years, and we do so promptly and at an honest charge. Ten-Tec solves communications problems. If you have a special need, try us. We may have a cost effective solution. Your inquiry will be most welcome.

Ten-Tec manufactures communications electronics for non-amateur radio applications too. Some are custom designs for special applications and some are treated as catalog products.

PRECISION TOOL AND DIE SHOP. Almost in the "secret weapon" category is our in-house tool and die shop. For 20 years, we have been a supplier of superbly designed and crafted molds, forming dies and production jigs and fixtures for our own use as well as many other manufacturers throughout the region. Our well-equipped shop is staffed with toolmakers with many years of experience. You are not likely to be a customer for tools and dies but if your employer is, they may profit from discussing their needs with us. You do benefit from the design flexibility and "bottom line" economics resulting from this in-house capability.

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This is a 100 watt PEP transceiver that operates in the 2 to 12 MHz range. "No-tune" solid state design is ideal for non-technical operators. All modes. Primary power is 12/14 Vdc. Ideal for mobile or base operation. Excellent receive and transmit performance, channelized for simplicity, highly reliable, compact and weighs only 10 lbs.

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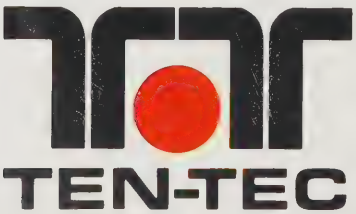

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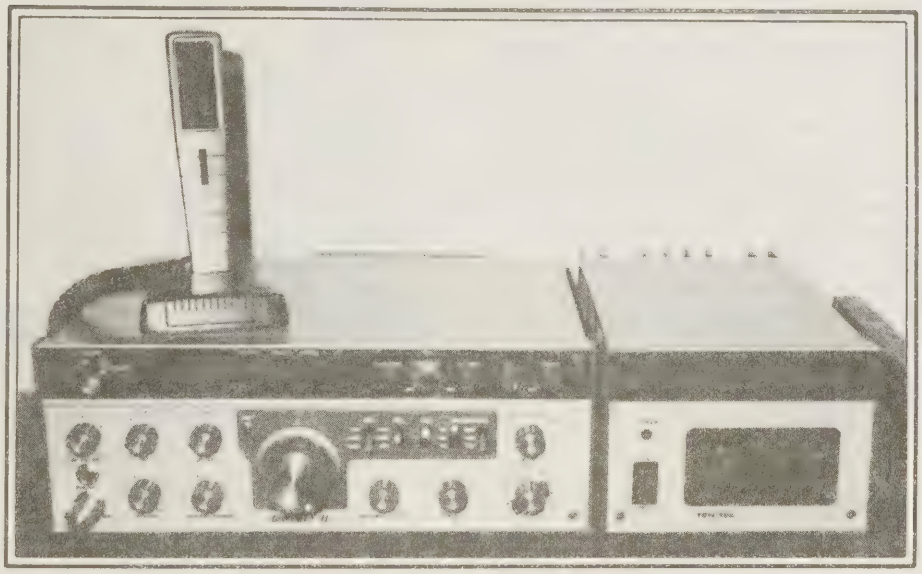
CQ REVIEWS:

The Ten-Tec Corsair II Transceiver — Part I

BY JOHN J. SCHULTZ*, W4FA/SV0 DX

Unpacking a new transceiver from its shipping container has always been an exciting experience for me because no matter how much advertising copy one sees on a given transceiver, there is nothing like viewing the actual piece of equipment. So when I did unpack the Corsair II from its very well protected shipping container, I was immediately impressed by its bright, new styling as compared to the current trend of most transceivers to be styled in rather dull, darkish, "military" tones. The Corsair II has bright styling in that its front panel is done in a very light gray tone, and the various control knobs and cabinet trim panels continue the gray color theme in slightly darker shades. The color scheme reminded me very much of the latter series of the former Collins S-Line equipment.

Anyone who is really interested in the Corsair II, however, is certainly going to immediately ask if there is anything more to the Corsair II than a new "paint job." Well, that was exactly my question, since I was very well acquainted with the original Corsair transceiver. Therefore, I began to look around the outside and inside of the Corsair II, and I did indeed notice some significant changes. An extra front-panel Bandpass Filter control has been added, many of the smaller front-panel controls have been completely changed to provide for keyer speed control (a new feature), independent noise blanker level and width controls have been added, etc. On the back panel, various phono jacks have been added for 12 VDC accessory devices, and a keyer paddle jack and three controls for VOX operation (Gain, Delay, and Anti-VOX) have been added. Internally, several new shielding and PC-board arrangements are apparent. Indeed, as it became apparent later when the actual PC-board circuitry was studied, major circuitry changes were made on various boards, and some completely new boards were introduced. It seemed fairly clear that the Corsair II deserved a detailed review on its own. Also, since the original Corsair transceiver was introduced well over two years ago, many newer amateurs are probably not acquainted with the original unit. In order to cover as many readers' interests as possible, I'll describe the Corsair II from the "ground up" and try to highlight now and then some of the interesting features that make the Corsair II different from the original Corsair.



The Corsair II together with its matching Model 260 Power Supply.

General

The Corsair II is a 100 watt output class transceiver designed for use on any mode and on all existing and proposed amateur bands. Detailed specifications for the transceiver are shown in Table I. Users interested in operation out-of-band (e.g., MARS) might notice the PTO overrun on the band edges. Compared to the original Corsair, the Corsair II specifications present some interesting changes. A few of them:

1. Five IC's and a few more diodes have been added.

2. The receive selectivity has been increased by using a 16-pole crystal ladder unit with a better shape factor.

3. A new variable audio bandpass filter centered on 750 Hz has been added.

4. Adjustable blanking width, to complement the adjustable threshold, has been added to the noise blanker.

5. The dynamic range on receive has been increased from 90 to 95 dB.

6. Receiver recovery delay is specified for the first time (a first for any transceiver manufacturer).

7. On transmit, the SSB filtering has been increased from four to eight poles.

8. An internal keyer has been added, as a standard feature, which covers 8 to 50 wpm and which has a 40-character read/write memory.

9. On transmit, unwanted sideband suppression has been increased by 15 dB.

10. Numerous front-panel and rear-panel controls and connectors have been rearranged.

To say the least, the crew from the "Tennessee Technology Corridor" (that's from a label on the bottom panel of the transceiver) has done far more than just repaint the original Corsair. In fact, from what I have learned from Ten-Tec, they intend to continue to produce the Corsair series for a long time to come.

*c/o CQ Magazine

Say You Saw It In CQ

The RF preamplifier stage in the Corsair II can still be switched in or out, various optional filters are available, and the passband tuning feature is retained along with selectable AGC, notch filter, RIT/XIT, etc.

On transmit, a full 95–100 watts output is easily achieved without the use of any cooling fan *whatsoever*, either on the transceiver itself or on its optional mating Model 260 power supply. The only caution Ten-Tec recommends is that when the Corsair is used key-down for more than 20 minutes (!), a small external fan should be directed on the transceiver's heat sink. the reason for this is not that the final transistors will burn up, but rather that the heat sink will become so hot (200 degrees F) that touching the heatsink accidentally might result in a serious finger burn. The now rather famous Ten-Tec full break-in operation is available on CW complete with CW sidetone. The metering includes forward peak reading power, SWR (without any "set" meter preset), speech processing monitoring, and final collector current reading. Table I doesn't mention speech processing, but there is definitely a very good AF-type speech processor in the Corsair II.

All in all, the Corsair II does deserve a bit of a detailed examination, and so we shall proceed.

Corsair II Specifications

General

Frequency Coverage: 1.8–2.3, 3.5–4.0, 7.0–7.5, 10.0–10.5, 14.0–14.5, 18.0–18.5, 21.0–21.5, 24.5–25.0, 28.0–30.0 MHz transceive. (VFO provides approximately 40 kHz overrun on each band edge.)

VFO Stability: Less than 15 Hz change per degree averaged over a 40 degree change from 70 to 110 degrees F after 30 minutes warmup. Less than 10 Hz change 105 to 125 VAC line voltage when using a Ten-Tec power supply.

Tuning Rate: Vernier, 18 kHz per revolution, typical.

Readout: 6 digit, 0.3" LED numerals.

Accuracy: ± 100 Hz.

Semi-Conductors: 1 LSI, 25 IC's, 94 transistors, 109 diodes, 6 LED readouts.

PC Boards: 22 PC assemblies with plug-in cables.

Construction: Rigid steel chassis. Extruded aluminum front panel with two-tone gray inserts. Textured gray top and bottom, snap-up stainless steel bail.

Transmitter

DC Power Input: Maximum 200 watts at 14 VDC CW and SSB. 100% duty cycle for up to 20 minutes.

RF Power Output: 85-100 watts, typical.

Output Impedance: 50 ohms, unbalanced.

Microphone Input: High impedance. Accepts high- or low-impedance microphones with 5 mv output. Polarizing voltage available for electrets.

T/R Switching: VOX or PTT on SSB. Instant break-in or semi-break-in on CW.

CW Sidetone: Internally generated. Adjustable tone and volume independent of AF gain control. Operates only in CW mode.

Programmable Iambic Keyer: 8–50 wpm with 40-character memory.

SSB Generation: 9 MHz, 8-pole crystal ladder filter. Balanced modulator.

Carrier Suppression: 60 dB typical.

Unwanted Sideband Suppression: 60 dB typical at 1.5 kHz tone.

Spurious Output: Better than – 45 dB relative to full output.

Meter: Forward power, collector current, SWR, audio processing level. Selectable 4-position switch.

CW Offset: 750 Hz, automatic.

ALC Control: Front panel adjustable. 30 to 100 watts output, LED indicator.

Table I– Corsair II specifications.

Circuitry

The basic block diagram of the Corsair II is shown in fig. 1. Basically, the Corsair II is also a single conversion design using a 9 MHz IF but with an additional down/up frequency conversion to provide the passband tuning feature. The PTO feeds a variable 5.0 to 5.5 MHz signal into the "Osc./Mixer" board where that signal is mixed with the output of a crystal oscillator so the signal going into the "RF Mixer" board is correct to work with a 9 MHz IF. For instance, for operation on 40 meters, 7.0-7.5 MHz, the PTO output frequency is translated to 16.0–16.5 MHz in the "Osc./Mixer" block. In this manner, full 500 kHz coverage is obtained on the 1.8, 3.5, 7.0, 10.0, 14.0, 18.0, 21.0, 24.5, and 28.0 to 30.00 MHz bands (the latter in four 500 kHz ranges). Crystals are included for the 10.0, 18.0, and 24.5 MHz bands, and the Corsair is ready to go on those bands. A few bonus features are that the PTO range actually has about a 30–40 kHz overrun on band edges so many MARS frequencies are covered, the 1.8 MHz band extends to 2.3 MHz to cover part of the Marine band, and the 10 MHz band includes, of course, WWV.

In the receive mode, incoming signals are no longer routed through the lowpass filter assembly, but rather directly via a diode switch on the LL (low level) Driver board to the BPF (bandpass filter) board. The latter contains separate, multiple-pole filters for each band. The signal is then routed to the RF Mixer board which is shown, in detail, in fig. 2. A 2N3866 (Q3 in fig. 2) is still used as the RF amplifier stage, but a great many circuit details have been changed on the board. The RF amplifier stage is a broadbanded, no-tune design and can be diode switched in or out. After passing through the amplifier stage, the signal is routed to a double balanced mixer which uses an integrated diode assembly, D13. The local oscillator signal comes in from the left (terminals marked L0), and the incoming signal is translated down to the 9 MHz IF in the mixer stage. It then proceeds to a low-noise amplifier stage, Q6, and some broad IF filtering (Y1). The signal then "splits," partly exiting via Q7 to the noise blanker and partly proceeding via more broad IF filtering (Y2) to the balanced diode switch assembly (D9–12) which is controlled by the noise blanker. Detection of fast-rise spike-type noise pulses by the noise blanker causes it to generate a blanking signal which gates Q5 and causes the balanced diode switch assembly to instantly interrupt the IF signal flow. It would be impossible to go into all the circuitry changes on the RF Mixer board, but obviously a lot of effort was devoted to improving the signal-handling capability, improving the purity of the

The rear panel. Note that there is no blower fan! Enough connectors for external accessories are provided to satisfy just about any application.

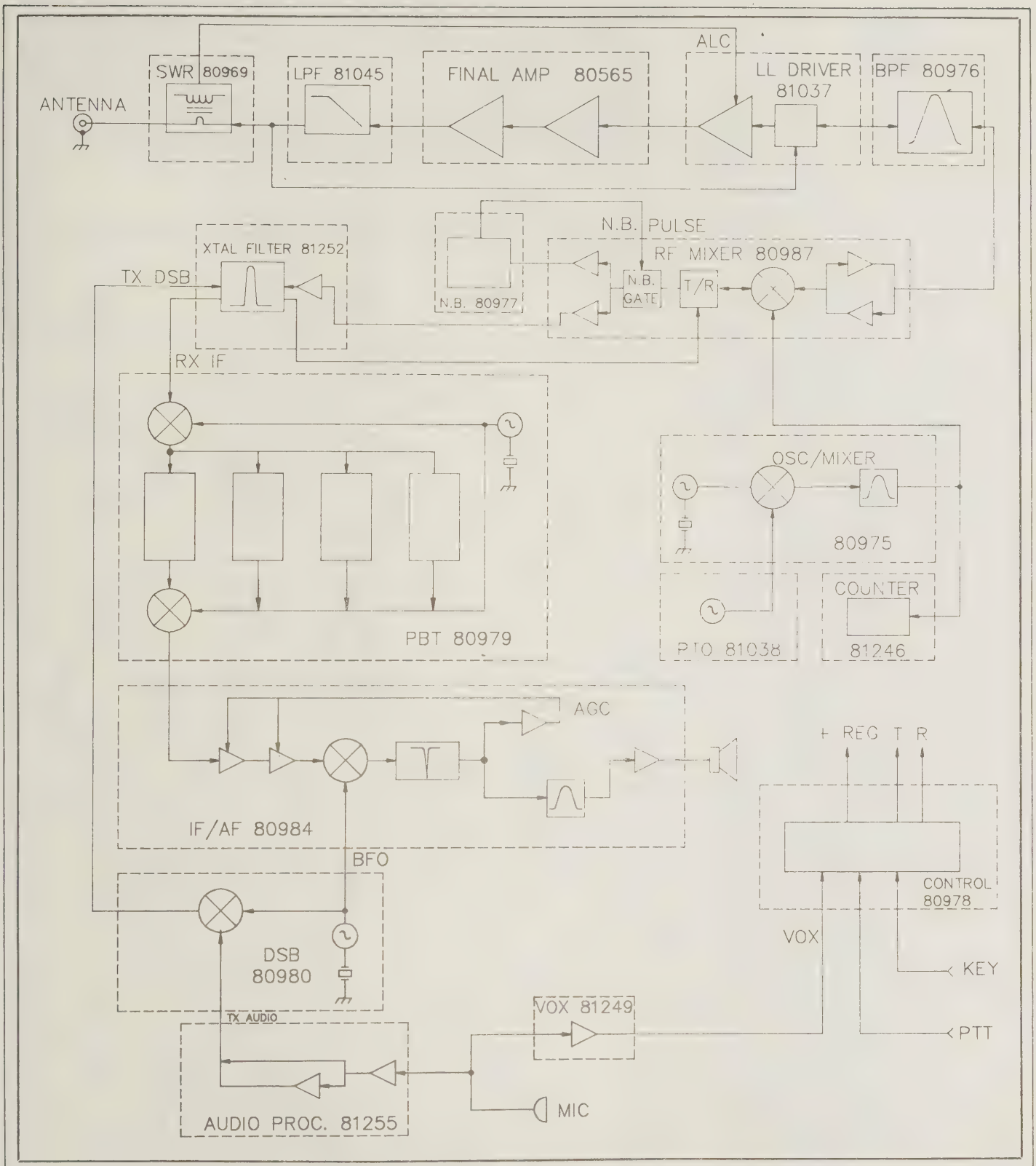


Fig. 1– Block diagram for the Corsair II.

mixing process, and adding extra filtering to the IF signal. The signal is next routed to a new crystal filter board which contains a standard 8-pole, discrete crystal filter. It sets the basic IF bandwidth on receive and acts as the SSB filter on transmit.

On receive, the signal then continues to a passband tuning board. The board contains a standard 8-pole, 2.4 kHz SSB filter with provisions for optional 8-pole 1.8 kHz SSB, 6-pole 500 Hz CW, and 6-pole 250 Hz CW filters. Ten-Tec must have been quite satisfied with the design of this board, since nothing more than a few minor resistor values have been changed over the original design. For that reason, the schematic diagram is not presented. The idea of its operation remains the same, of course. By varying the injection frequency to mixer stages

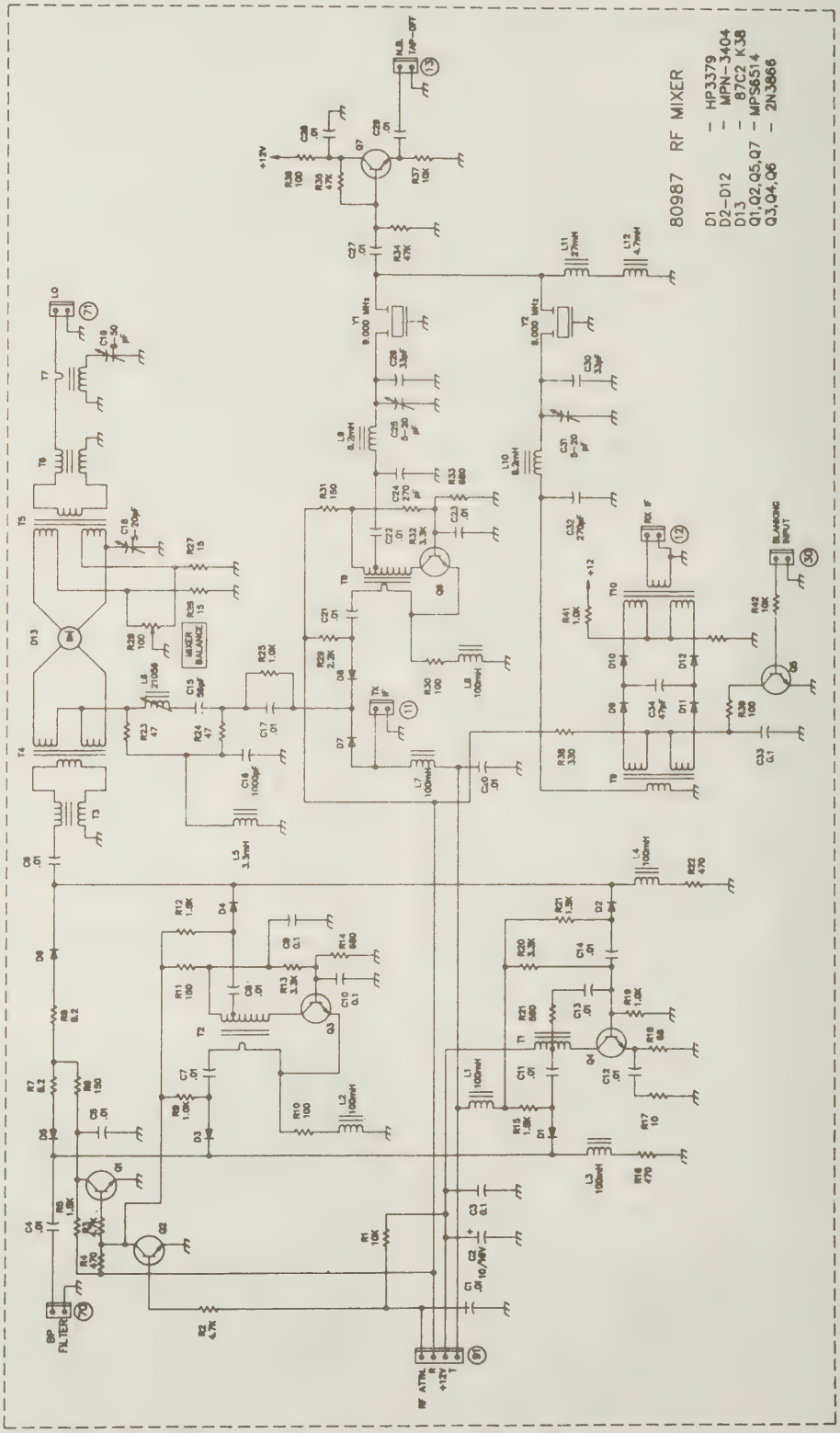
both before and after the filters on the board, the passband of the chosen filter on the board is moved across that of the preceding 8-pole SSB filter on the new filter board which was previously mentioned. One can imagine two doorways physically moving across each other to provide a full doorwidth opening or an extremely narrow opening. In any case, using just the standard filters supplied with the Corsair II, one has 16 poles of IF filtering and using the passband tuning feature one can vary the IF bandwidth on receive from 2.4 kHz to roughly 600 Hz.

After the passband tuning board, the signal is routed to the IF/AF board. This board has also been significantly redesigned and is presented in fig. 3. The board handles most of the receive functions including RF gain control, audio notch and audio bandpass filters, AGC action, S-meter control, audio amplification, and CW sidetone. One can pretty much see the signal flow around the board from the RX IF input point through IF amplifiers Q1 and Q2, demodulator Q4, through the notch filter stages of U1, the bandpass filter stages of U3 and U4 and, finally, to U5 as an audio output amplifier. The notch filter is tunable from about 200 to 3500 Hz with a 50 dB notch. The bandpass filter, a new feature, has a fixed center frequency of 750 Hz, but can be controlled to produce a flat audio response or one that increasingly peaks at 750 Hz until it reaches a 200 Hz bandwidth with skirts rolling off at −24 dB/octave. The use of the two audio filters plus the use of the variable IF passband tuning pretty much negates the need for an optional CW IF filter for the casual CW operator. The AGC is of the time delay or "hang" type, and it does follow the setting of the audio notch control. The sidetone oscillator on the board has both adjustable pitch and volume controls. A bit complicated spotting oscillator circuitry which runs back and forth among several PC boards produces a 750 Hz signal, the same as the IF offset on CW. A front-panel pushbutton control zero beats incoming signals for exact frequency spotting.

In the transmit mode one can, more or less, visualize the circuitry as working backwards if one follows the signal flow arrows in fig. 1. The microphone signal is split and goes to both the VOX and Audio Processor boards. The latter board in the Corsair II has been extensively redesigned and is shown in fig. 4. Basically, the circuitry conditions the audio through a process of compression followed by soft clipping. U2B is the compression stage, the output of which partially couples to U3B, which in turn drives Q1 as a shunt element at the input of U2B. D3 and D4 are the clipping elements. The processing level is adjustable by a front-panel control. The VOX circuitry has been moved to a separate new board, and the three controls associated with the VOX function (gain, delay, and anti-VOX) have been installed as rear-panel controls on the Corsair II, since they usually require only infrequent adjustment.

After passing through the speech processor board, the AF signal goes to a DSB board where a double sideband signal is generated. The DSB signal passes through the standard 8-pole 2.4 kHz SSB filter and then on to the RF Mixer board where it is translated to the final output frequency. The signal is then amplified in various stages until it reaches a pair of MRF-458 transistors which operate in a push-pull Class AB configuration with 200 watts DC input on all bands. The PA stage

Fig. 2– The "front end" of the Corsair II underwent various design changes.



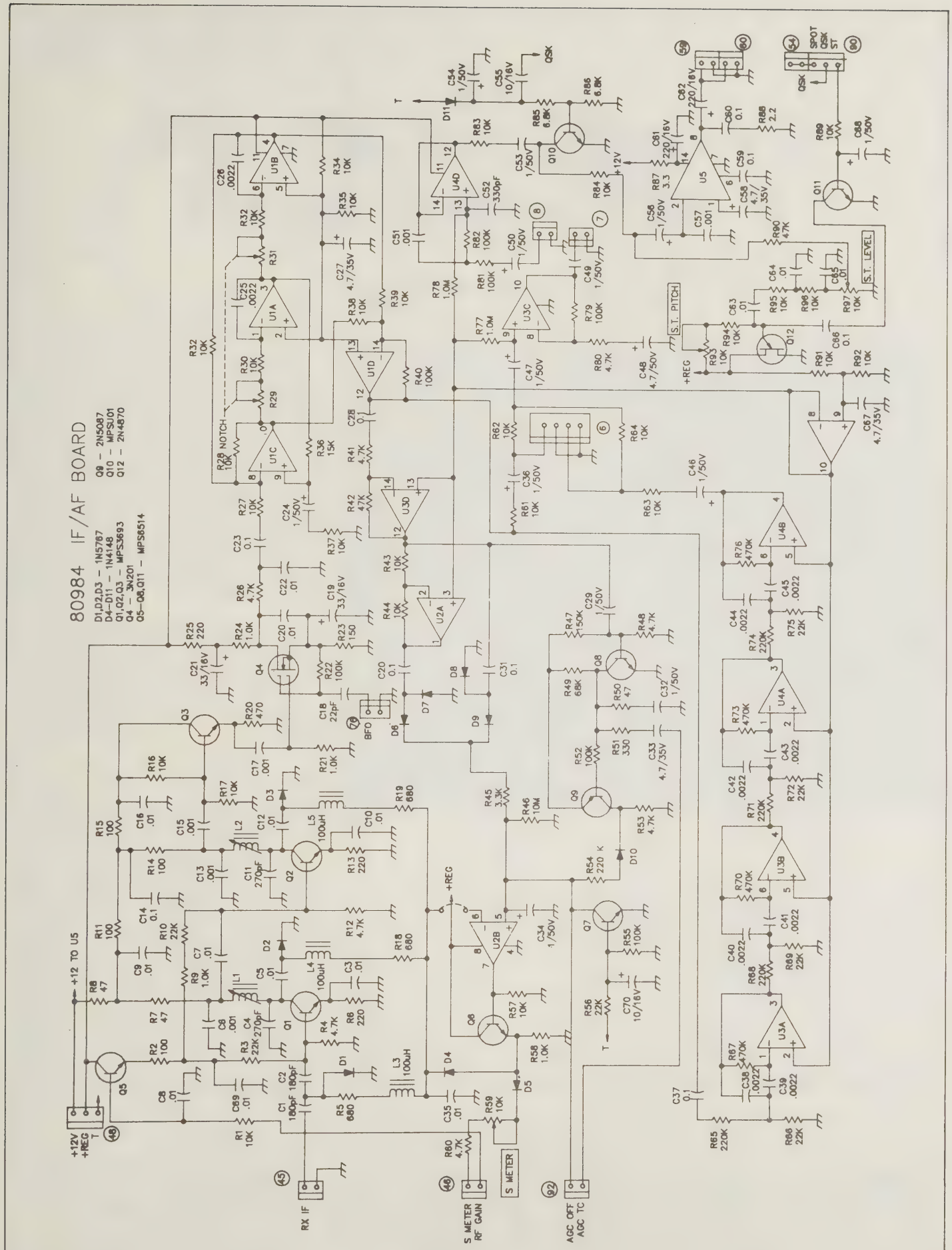


Fig. 3– The IF/AF board. Functions are discussed in the text.

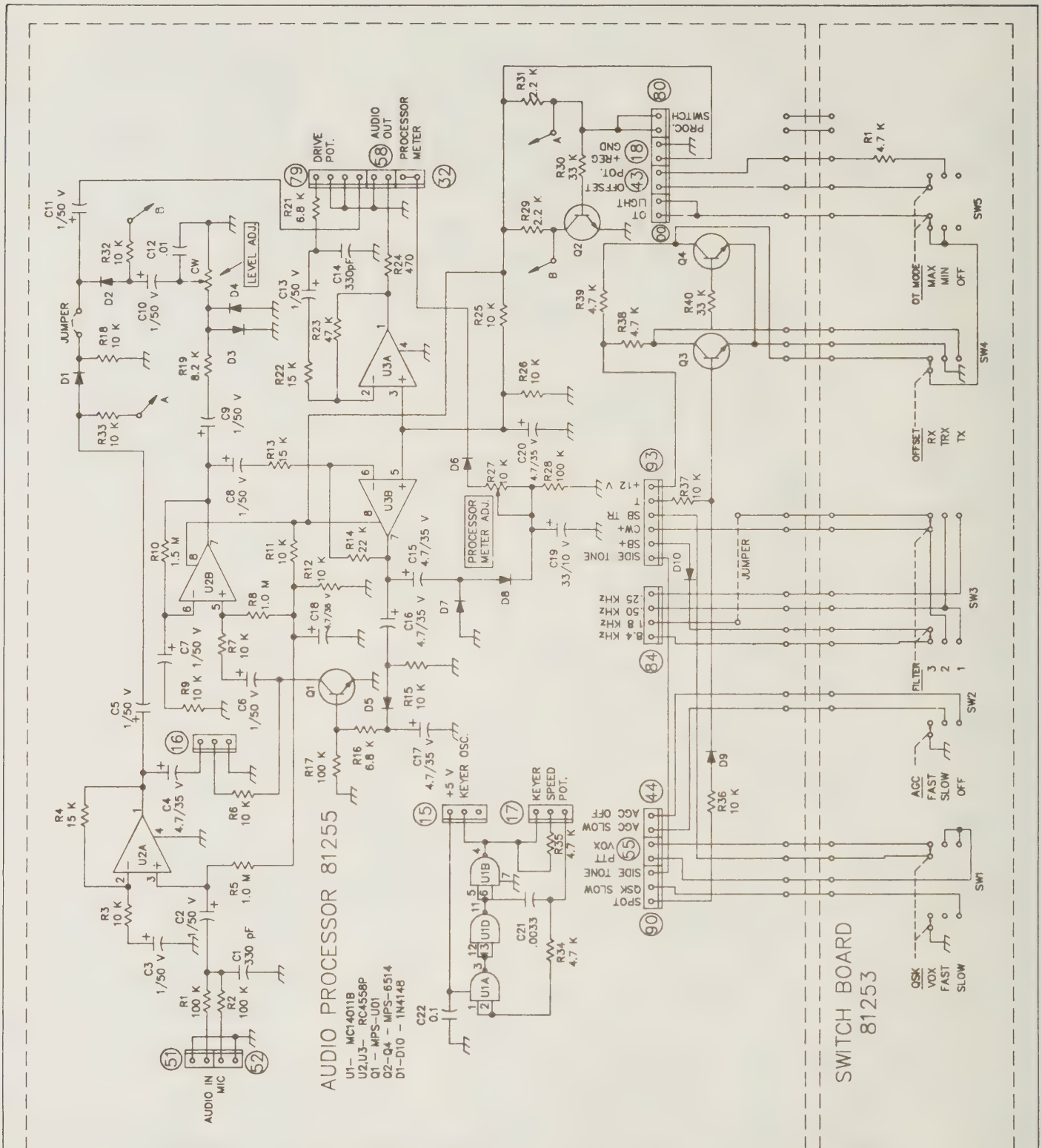


Fig. 4– The audio processor board. The processing uses a combination of compression and soft clipping and is very effective.

is followed by switched low-pass filters and a SWR detection board which supplies an ALC feedback voltage and a control voltage which is used to drive an "ALC" LED on the front panel so one has an instant indication if a safe ALC level is exceeded.

The front-panel metering is much the same as in the original Corsair. The meter is an "S" meter on receive and a multifunction one on transmit, which can be switched to monitor forward power, collector current, SWR, or the audio processing level. In the SSB mode the forward power indication is peak reading (PEP on SSB).

(To Be Continued)

Next month we'll continue our review with a description of the frequency readout system.

CQ REVIEWS:

The Ten-Tec Corsair II Transceiver—Part II

BY JOHN J. SCHULTZ*, W4FA/SVØDX

In reviewing a new piece of equipment, it's very hard to set guidelines, especially how much space to allow for publication. Sometimes the equipment is deceptively simple, and through use one finds much to write about and describe. In these instances the review, if run intact, would take up a majority of an issue, excluding other articles of interest. Although I don't like the practice of publishing reviews in several parts, it comes down to the only practical way of presenting all of our findings and at the same time giving readers additional amateur radio material to read and enjoy.

This month we conclude our review of Ten-Tec's Corsair II transceiver. Last month we left our discussion at the point of describing the front-panel metering. We now take up that discussion with a description of the Corsair II's frequency readout system. —K2EEK

A look inside with the bottom cover shell removed.

The frequency readout still uses 6-digit 0.3 inch LED numerals, but the color scheme has been changed with the display having five yellow readouts and a green one for hundreds of Hertz. However, behind the scenes there is much more than a cosmetic color change. The display driver circuitry has been completely changed and a logic board with a new MC68705P3 LSI circuit introduced. Fig. 5 shows the logic board diagram. Apparently, the LSI handles a variety of functions concerned with control, counting, and display, and last, but not least, it contains the iambic keyer and keyer memory functions.

Finally, to sort of "top off" an overview of the new circuitry in the Corsair II, fig. 6 shows the LPF-TR (low pass filter—transmit/receive) board. This board is the heart of QSK operation when using CW. The final amplifier output is disconnected from the low-pass filters and antenna circuit during *receive* by relay K1 to prevent signal "suck-out." Q1 indirectly controls the connection of the antenna to the receive terminals during non-transmit periods by biasing diodes D1 and D2. These PIN diodes, when not forward biased for receive, are back biased for antenna isolation on transmit by a voltage rectified by D3 to D6. The circuitry looks relatively simple, but it requires a very careful balance of switching and recovery times to achieve high-speed, clean, full QSK.

Construction

During the course of trying to obtain at least a basic idea of the circuitry in the Corsair II, a fair amount of time was spent roaming around the PC boards inside the transceiver. All of the boards are very well laid out, the component locations are clearly labeled, prime quality parts are obvious, and each board is interfaced with connectors to other boards so any individual board can be removed for service purposes rather easily. The only minor point that was missed, in my opinion, was that the internal speaker did not have a cable disconnect at the speaker terminals. Therefore, when I rather quickly removed the bottom cover (which holds the internal speaker), I pulled the voice coil connections on the speaker completely apart. A new speaker was purchased and easily installed.

From a mechanical construction viewpoint the Corsair II rates very high marks. Good hardware is used throughout. There are some riveted mountings used for phone-type rear-panel connectors. But, for the connectors which are likely to receive hard usage (e.g., the SO-239 antenna connector) solid hardware with plenty of lockwashers is used. As with the original Corsair, one continues to have the feeling that the Corsair II was designed with a great deal of attention to those internal details which would augur

c/o CQ Magazine

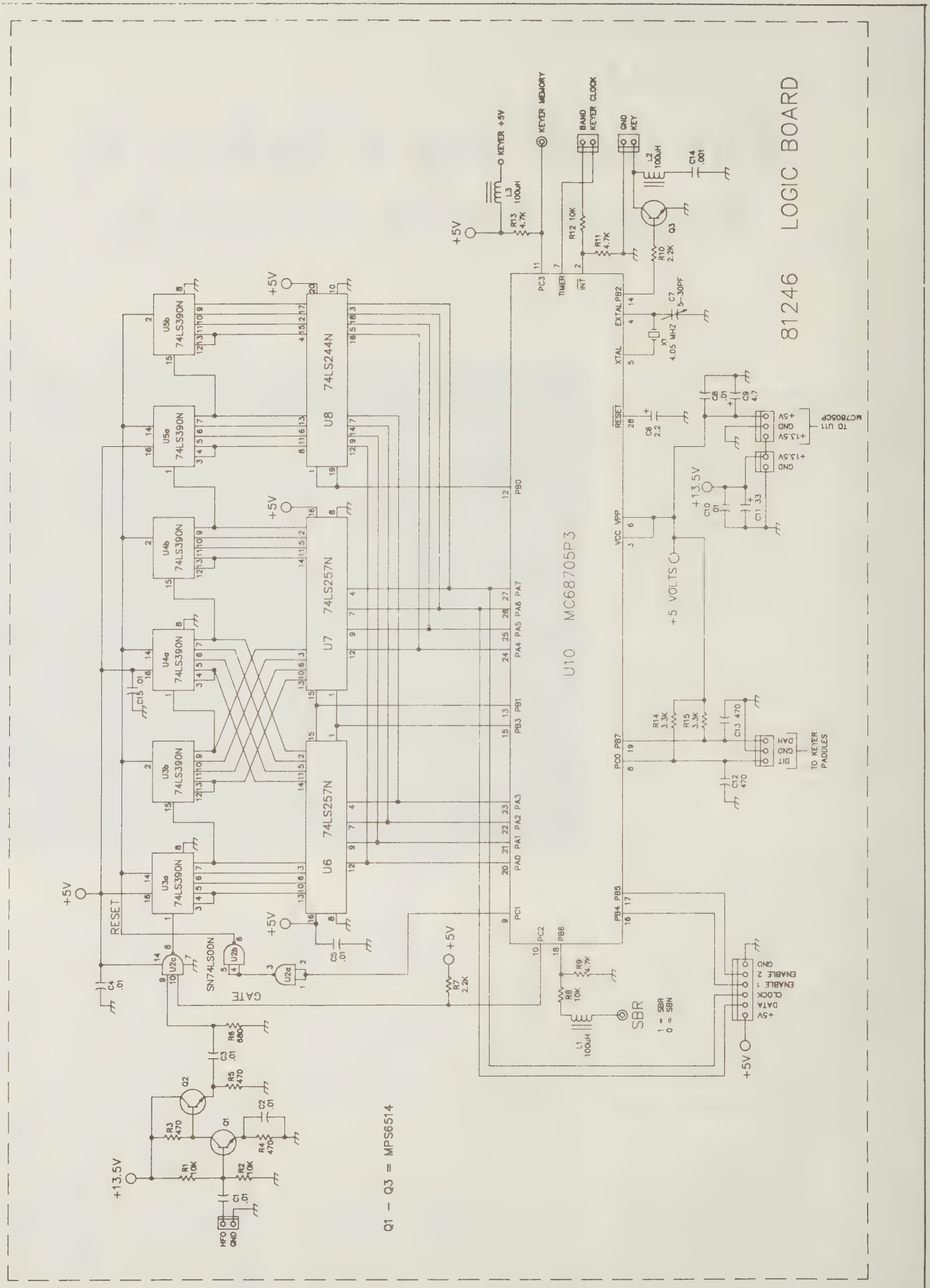


Fig. 5– The logic board. U10 also contains the keyer circuitry.

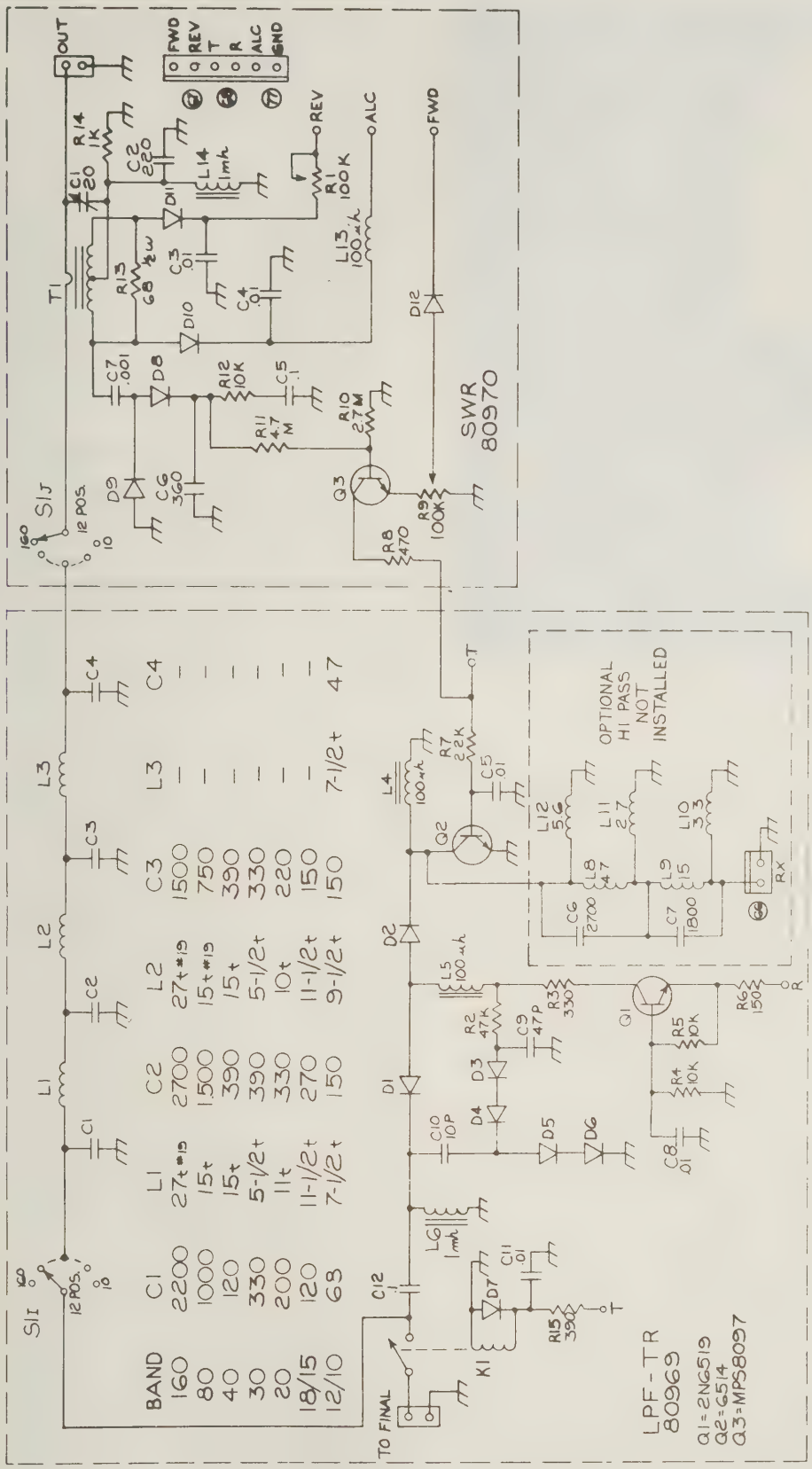


Fig. 6– The low-pass filter and transmit/ receive board which contains the antenna switching circuitry for QSK operation.

for the combination of an extremely long, normal service life, yet allow the relatively easy removal of PC boards or other components if service work is necessary.

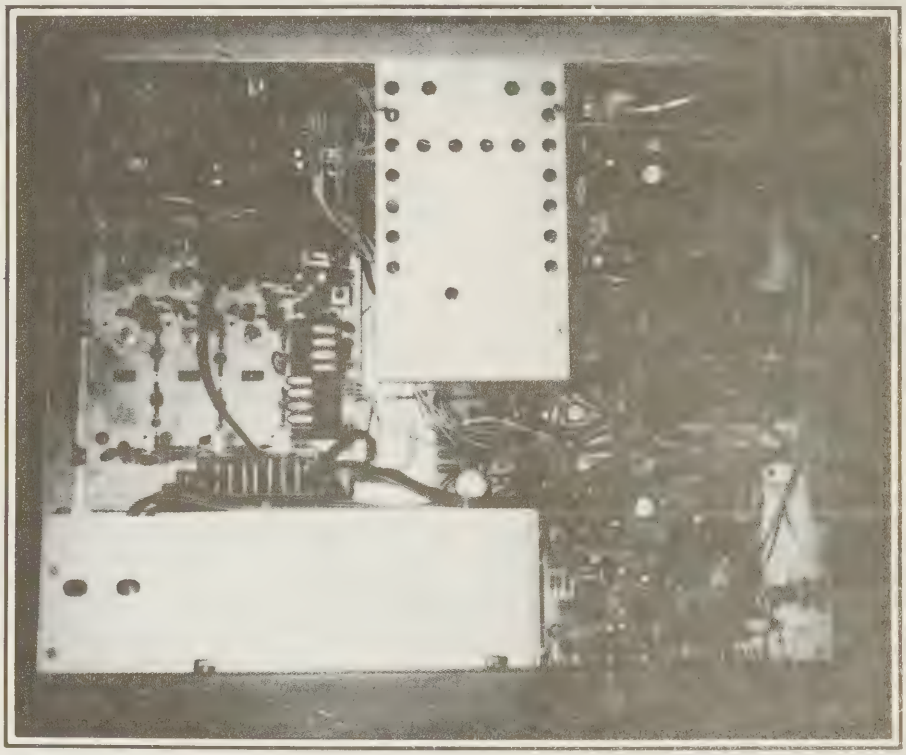
Two of the photographs show the transceiver with its top and bottom outer shell covers removed. Ten-Tec has stayed, basically, with its original design concept of distributing the transceiver's circuitry among a large number of PC boards. In fact, although all sorts of circuit boards have changed, their "head count" remains at 22. This construction approach requires a good amount of interconnection wiring among the boards, but it keeps the signal circuits better isolated, and the interaction between diverse signal paths is minimized.

One can see from the photographs that the PC boards are very neatly arranged. Some of the cable runs seem to be a bit haphazard, but in reality they are well grouped and held together by numerous cable ties. The shielding of individual boards or sections has been increased. For instance, looking at the photograph of the bottom interior one can still see the shielded PTO assembly behind the main PTO tuning knob. However, new shielding has been added to completely enclose the Oscillator/Mixer assembly (middle right) and the bottom of the power amplifier section (lower right). The actual power amplifier is in another separately shielded enclosure directly connected to the heat sink on the rear of the transceiver. Because of the added shielding, only a small portion of the bandswitch can be seen (upper right corner). All of the main RF paths for the bandpass and low-pass filters are switched by the bandswitch. No relays or diode-switching schemes are used. Diode switches are used, however, in some sections of the transceiver for in/out switching of the RF amplifier stage on receive, selection of the optional IF filters, routing of the IF signal, and various other functions.

Looking at the top interior view, one immediately spots that a new shield has been placed over the top side of the power amplifier section. The large shielded enclosure in the upper middle part of the photograph used to house the frequency counter circuitry. It still houses that type of circuitry and also the circuitry shown in fig. 5. One can see three blank areas (middle left) which are provided for mounting any of the three optional IF filters.

Bench Checks

The "specs" measured on the Corsair II proved to be better in many cases than those found on the original Corsair. Certainly, none came out worse. There are no super dramatic improvements in any given area, but the fact that so many improvements were noted "across the board" confirms again that Ten-Tec worked over the original design in every corner. Some of the measurements were so uniform it was not felt useful to tabulate them. For instance, the power output varied at most ±2 watts from 100 watts on all bands. Full power output was available for at least 30 minutes key-down without anything seeming to go astray (not using any external fan). Transmit third-order IMD products on 20 meters measured −34 dB at full output (an improvement of several dB). Unwanted sideband rejection and carrier suppression both improved to better than −63/64 dB.



A look inside with the top cover removed.

On the receive side, the dynamic range showed the most improvement, going from 90 to 96 dB (SSB bandwidth on 40 meters). The third-order intercept point was an excellent +19 dB with the RF amplifier *out* and +7 dB with it active. The receive "birdies" of significance were exactly those noted by Ten-Tec in the instruction manual: 1.838, 21.300, and 28.980 MHz. The latter can be eliminated by using the VFO overrun on the 29.0–29.5 MHz 10 meter band segment.

Operation

The Corsair II provides the same light and easy tuning "feel" as the original design with the main tuning covering about 18–20 kHz per revolution. Markings on the skirt of the knob can be used for quick but approximate QSY's, such as the typical up/down 3 or 5 kHz. Ten-Tec didn't follow my original advice to provide a deeper fingertip well on the knob. That would still be my preference. The new yellow color for the digital frequency readout is very easy on the eyes while being sufficiently bright under any ambient light condition.

Ten-Tec makes a point of the fact that the "S" meter reads the commonly accepted standard of 50 microvolts for S9. It does indeed on 20 meters. Another transceiver I was testing in a price class above that of the Corsair II required 300 microvolts to read S9.

As with the original design, the low-noise design of the transceiver creates the impression of even relatively weak signals "popping" out of a quiet background as one tunes across a band. It definitely will be pleasing to an operator who spends hours behind a transceiver searching for rare DX.

I rarely had to deactivate the RF amplifier stage (done by means of a pull-switch on the RF gain control) to avoid overload conditions even when encountering strong broadcast QRM on some bands. However, even the best designs can "cave in" under extreme conditions, so it's nice to know the switch is there. It's also nice to see that separate RF and AF gain controls are retained.

As for combating QRM, the optional filters, the standard notch and passband tuning, and the new bandpass tuning features provide many possibilities. Since none of them are on ganged controls, they are all easy to manipulate. The offset tuning (selectable ±1.5 or 4 kHz) is also extremely useful, and it can be used for either receive or transmit offset. The new bandpass filter control, although centered on 750 Hz and presumably intended for CW reception, was also very helpful on SSB reception. The passband tuning acts as a variable bandwidth feature on SSB (either with the standard 2.4 kHz or optional 1.8 kHz SSB filter) and functions very smoothly, although I would have preferred that the tuning range be spread over more of the potentiometer rotation. If one of the optional CW filters is installed, the passband tuning no longer changes the bandwidth, but the effect is produced of having a BFO control so stations close together within the narrow bandwidth of the filter can still be distinguished by their pitch. All in all, I would say the Corsair II provides very balanced features on receive for both the CW and SSB operator. For casual operating (however one defines that), the optional filters are not necessary. For serious DX or contest operating on a crowded band, one or more of the optional filters becomes a very logical investment.

On the transmit side, excellent reports were obtained on both CW and SSB, although my CW ability is really below the capabilities of the transceiver. Using either mode tune-up quite simple. The mode switch is placed in the "lock" position and the drive control advanced until the ALC LED lights. While doing this, any external accessory, such as an antenna tuner, can be adjusted. When operating CW, tune-up is then complete. When operating SSB, one has to double-check that the ALC LED only lights on voice peaks and, if not, advance or retard the drive control (now acting as a microphone gain control) accordingly. One can use the panel meter to check various parameters on transmit, but once initially set up, the ALC LED "tells it all." Once one gets used to operating the unit, one can even sense from the LED if the speech processor is correctly adjusted.

For CW operation one has all sorts of possibilities to key the unit. An external electronic keyer or straight key can be used, or one can use the internal keyer by connecting an external paddle. The internal keyer worked as smoothly as any I have ever tried. The use of the built-in keyer memory requires a simple, external switch connection to set the memory for either programming or playback. Forty characters, including pauses, can be recorded. In playback, the speed is set at that of the front-panel keyer speed control.

Full or semi break-in operation is available. I'm sure I couldn't "exercise" the Corsair II fully on QSK, but at 20 wpm plus the full break-in seemed to work perfectly. Considering that the receive recovery time is 30 ms and that a dot has a length of 30 ms at 40 wpm, the upper speed limit for full QSK must surely be at least 40 wpm. The 30 ms recovery time also means the Corsair II should be fully AMTOR compatible, although that mode was not tested. Naturally, the Corsair II has all the necessary features to operate full QSK with Ten-Tec's TITAN linear amplifier. The built-in sidetone is adjustable for volume and pitch by thumb-wheel controls reached via an opening in the bottom cover.

On SSB, consistent reports were received of full, clean modulation using Ten-Tec's Model 214 electret microphone. The speech processor deserves extremely high marks for a purely AF type. Comparison reports under medium to weak signal conditions (roughly S5 or below) indicated that the use of the pro-

cessor added about an "S" unit to the received signal. Many stations preferred that the processor be left in at all times. I couldn't find any fault with the processor—indeed it deserves great praise—but I did sort of feel that an opportunity was lost with the Corsair II to offer the user who also desires true RF-clipping-type processing a choice of processing methods. After all, an 8-pole SSB filter sits unused in the set during transmit, which would seem ideally applicable to filter a clipped SSB IF signal. I suspect the good folks at Ten-Tec can't accept the idea that *moderate* RF clipping produces better results than involved AF processing schemes.

Accessories

Besides the optional IF filters, the main accessories available are the Model 260 power supply, Model 263G remote VFO, and the Model 425 TITAN linear amplifier.

The 260 power supply is a fully regulated, overcurrent and overvoltage protected unit. It also contains a front-panel facing ceramic magnet speaker. It is a ruggedly constructed unit with a large heat sink on the rear panel for the pass transistors, and two jacks on the rear panel for accessories needing 12 VDC. A bottom-panel switch provides for 110 or 220 volt primary operation. The front-panel on/off switch is also a circuit breaker which can easily be reset if a quick overload takes place during tune-up, for instance. The 260 was used when testing the Corsair II, and it is a highly recommended unit. By the way, Ten-Tec does highly recommend that their Model 1140 circuit breaker be used in the 12 volt line to the transceiver if it is powered from a power supply other than the 260 or directly from a 12 volt battery. The breaker ensures a quick enough overcurrent response to protect the final amplifier transistors. The TITAN linear amplifier was covered in a previous review article. It interfaces, of course, fully and instantly with the Corsair II to develop a full legal-power-input station with full QSK on CW.

Owner's Manual

The manual for the Corsair II is, first of all, spiral bound. It's a small point, but it is one of the few manuals around that one can lay flat for page-by-page usage. The manual is easy to read and starts off with basic hookup information, condensed step-by-step operating instructions for those who are hell-bent to get the transceiver on the air a few minutes after hooking it up, detailed operating instructions so one can really appreciate how to use the transceiver after one calms down, and then finishes up with an alignment and service section. The latter section contains a block diagram, a main chassis wiring diagram, and schematic diagrams for each PC board to include voltage-level charts. Alignment instructions are also given for each PC board where such work is user-possible. Given the information supplied, an experienced amateur, even with only what today would be considered basic test equipment, can perform a considerable amount of troubleshooting and alignment work on the transceiver. Only the counter and logic boards would be beyond field service.

The Corsair II which was tested worked perfectly from the day "go," so I can't comment personally about any factory service work. But other amateurs with whom I have discussed Ten-Tec's service response continue to rate it as outstanding.

Summary

I think the point has been adequately made that the Corsair II is not the original Corsair with a few factory updates. It is a newly redesigned Corsair both inside and outside. The transceiver has sophisticated operating features, but is still very straightforward to operate. It makes sense that Ten-Tec has expressed an intention to continue to produce the Corsair line for those amateurs who obviously prefer its design philosophy and attention to details in execution of the design.

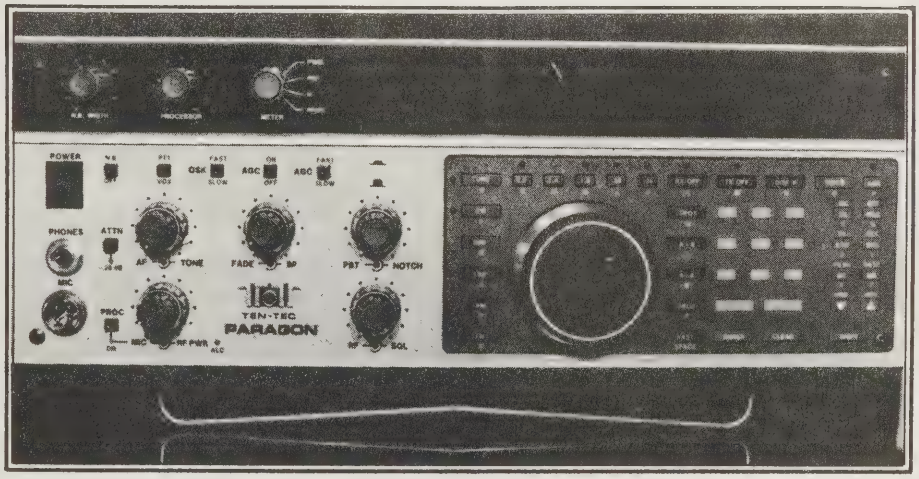
CQ REVIEWS:

Ten-Tec's PARAGON HF Transceiver

Part I – Overview and Technical Details

BY JOHN J. SCHULTZ*, W4FA/SV0DX

The PARAGON can be said to be the first microprocessor based, American-made transceiver which competes directly in its price class with imported transceivers. It comes from a manufacturer who has had a solid, long-term track record in the manufacture of amateur radio transceivers and an outstanding reputation regarding after-sales service. So, many amateurs might indeed have a special interest in taking a detailed look at the PARAGON. So, I have tried in this review article to take an in-depth look at the PARAGON starting with an overview of its features and circuitry and then going on to describe some of its special operating features and, finally, my own experiences after using the transceiver over an extended period of time.



Like they say in the advertisement, this is face to face with the PARAGON.

General

The PARAGON is a 100 watt output class transceiver that covers all of the HF bands and includes general coverage receive from 100 kHz to 30 MHz. It features direct keyboard frequency entry and bandswitching, dual digital VFO's, 62 memories (each of which stores frequency, mode, VFO A/B information, IF filter selection and a seven digit letter/number memo tag), memory scan (with channel lockout) and tuning of each memory channel via the main tuning knob or in an automated mode. Standard modes include CW (with full or semi break-in), SSB (with speech processor) and RTTY (true FSK or AFSK). FM is available as an option. Standard filters include a 6.0 kHz one for AM receive and a 2.4 kHz one for SSB/CW. Optional filters are available for 1.8 kHz and 500 and 250 Hz. There is a full range of both IF and AF selectivity controls (e.g. passband tuning, bandpass tuning, notch filter tuning, etc.).

An optional interface unit provides bi-directional communication between the logic circuits of the PARAGON and an external computer with RS232 capability. All of the keypad functions on the transceiver and the main tuning circuitry can be computer controlled.

The PARAGON is, of course, a completely solidstate design with no tuning controls except for the main tuning knob. The transceiver (with internal speaker) is contained in one enclosure while the power supply is external. Ten-Tec power supply and microphone accessories are available which allow the PARAGON to be immediately placed into operation as a complete station. The accessory items will be described in the final part of this article.

Please Take a Look

At the specifications for the PARAGON as shown in Table 1. It's a big table (because Ten-Tec provides so much detailed information) and, I realize, it can be boring reading to some. But, nonetheless, it provides a *wealth* of information. I should say factual information! The specifications are totally short on meaningless superlatives and concentrate strictly on facts and figures.

I won't go through the entire table but allow me to highlight various points:

Frequency Coverage: 100 kHz to 30 MHz on general receive. All bands, 160 through 10 meters, on transmit with modification possible for non-amateur band transmit.

Frequency Stability: an excellent 1 part per million per degree C even at 30 MHz.

Physical: A very light package (16 lbs) due to almost total aluminum construction. The dimensions would allow mobile or portable usage but augur best for home station usage.

RF Output Power: Adjustable up to 100 watts, key-down, in all modes. The power amplifier has no cooling fan and can operate key-down for 20-30 minutes.

Receive/Transmit Switching: Regular PTT or VOX. Fast or slow break-in on CW.

Transmit Spurious Suppression: Excellent at –60 dB for carrier and unwanted sideband suppression and quite reasonable

*c/o CQ Magazine

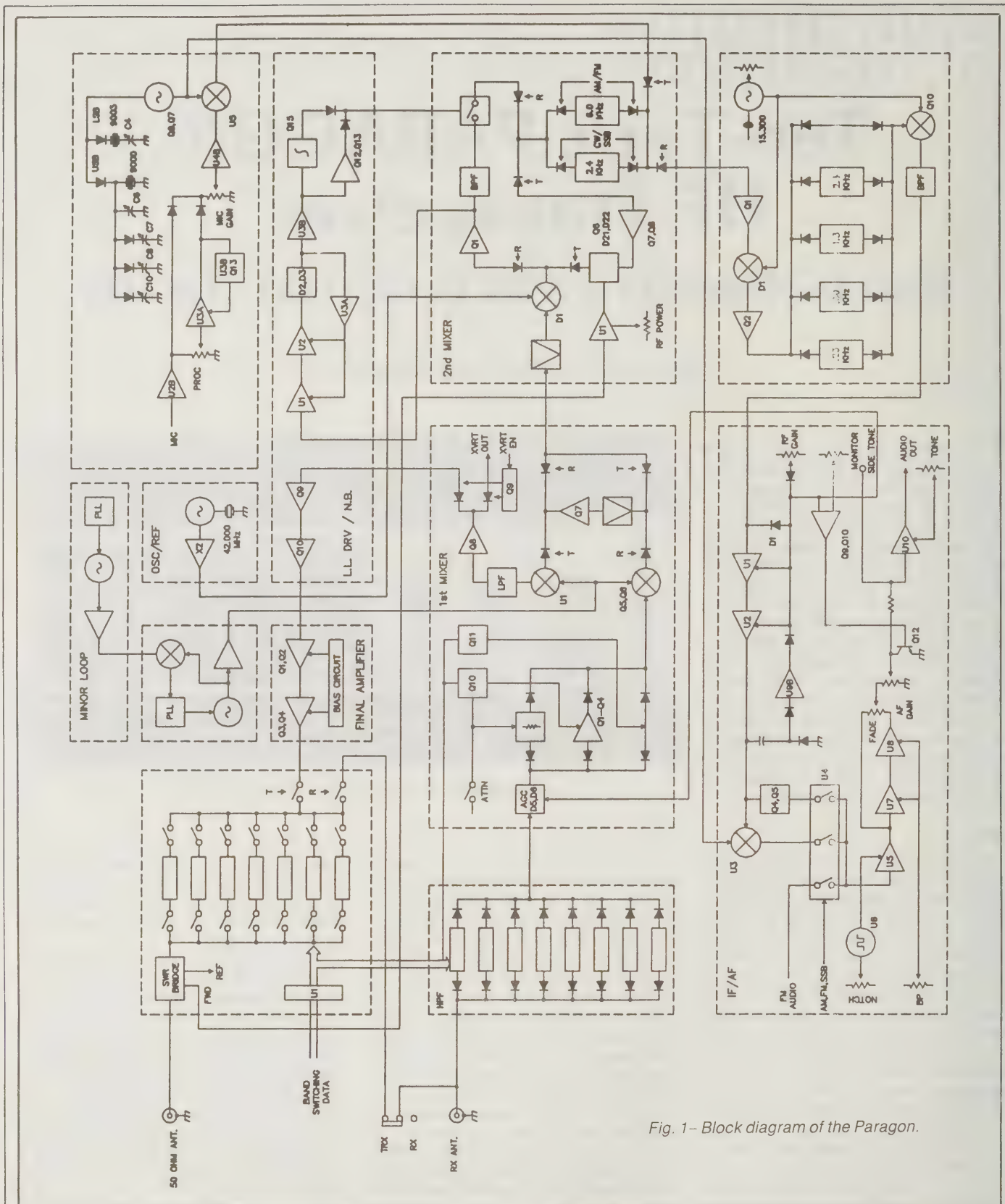


Fig. 1– Block diagram of the Paragon.

at – dB for miscellaneous spurious outputs.

Metering: Very complete including direct reading SWR, forward output power and audio processing level. A separate LED indicates ALC peaks.

Receive Sensitivity: Certainly state-of-the-art with 0.15 uV sensitivity in the HF range for CW and SSB modes.

Receiver Selectivity: Again, state-of-the-art with some outstanding skirt selectivity specifications, especially for the optional 1.8 kHz SSB filter, as will be discussed later.

Image and IF Interference Rejection: Outstanding at greater than –70 to –80 dB. These values appear to be due to careful "front-end" filtering plus the use of a 75

General

FREQUENCY RANGE	Receive: 100 kHz to 29.9999 MHz Transmit: Standard Ham Bands 160M—10M (Note: For operation outside Ham Bands contact factory.)
FREQUENCY CONTROL	Microprocessor controlled digital PLL synthesizer. 10 Hz resolution.
FREQUENCY READOUT	7 digit 10 Hz fluorescent readout.
FREQUENCY STABILITY	Worst case, 1 PPM per degree C. at 29.999 MHz.
ANTENNA IMPEDANCE	50Ω unbalanced.
POWER REQUIRED	Receive = aprox. 1.5A. Transmit = approx. 20 A. @ 13.8 VDC.
CONSTRUCTION	Rigid aluminum chassis. Extruded aluminum front panel. Textured top and bottom, snap up stainless steel bail.
DIMENSIONS	HWD 5¾" × 14¾" × 17"—14.6*37.4*43.2 cm.
NET WEIGHT	16 lbs.—7.25 kg.

Transmitter

MODES	USB, LSB, CW, RTTY (FSK or AFSK), (FM optional).
DC POWER INPUT	Maximum 200 watts @ 14 VDC CW, SSB, (FM). 100% duty cycle for up to 20 minutes. Continuous with auxiliary air cooling.
RF POWER OUTPUT	25 to 100 watts adjustable with front panel RF PWR control.
MICROPHONE INPUT	High/Low impedance. Four pin, front panel connector accepts microphones with 5mV (−62 dB) output. Polarizing voltage is provided for electrets.
T/R SWITCHING	VOX or PTT on SSB. Switchable FAST or SLOW QSK on CW.
CW SIDETONE	Internally generated, adjustable tone and volume independent of AF GAIN control.
SSB GENERATION	9 MHz, 8-pole crystal ladder filter. Balanced modulator.
CARRIER SUPPRESSION	60 dB typical.
UNWANTED SIDEBAND SUPPRESSION	60 dB typical at 1.5 kHz tone.
SPURIOUS OUTPUT	More than 45 dB below peak power output.
METER	Switchable forward power, SWR, collector current, audio processinglevel.
CW OFFSET	750 Hz automatic.
FSK SHIFT	170 Hz.
ATTENUATOR	Approx. −20 dB for 1.6 to 29.999 MHz, −10 dB for .1 to 1.6 MHz.
I-F FREQUENCIES	1st = 75 MHz, 2nd = 9.0 MHz, 3rd = 6.3 MHz (FM 3rd = 455 kHz).
RX ANTENNA INPUT	Switchable 50Ω phono jack.
IMAGE REJECTION	80 dB.
I-F REJECTION	70 dB.
NOISE BLANKER	Switchable on/off with adjustable width.
S-METER	Automatically switched on during receive. Calibrated to 50 μV at S9.
DYNAMIC RANGE	100 dB typical.
3rd ORDER ICP	+18 dBm
SQUELCH SENSITIVITY	AM, CW, SSB, FSK (1.6-29.999 MHz) = Less than 1 μV. Optional FM (1.6-29.999 MHz) = Less than .4 μV.
PASS BAND TUNING	±1.2 kHz.
AUDIO OUTPUT	1.5 watts @ 8Ω with less than 2% distortion.
NOTCH FILTER	250 to 2.2 kHz, 50 dB notch typical.
AUDIO BANDPASS FILTER	4 pole, variable center frequency 220 to 1.7 kHz, 35% bandwidth @ −6 dB. Variable fader control selects filtered or flat audio response.
TONE CONTROL	Variable 15 dB rolloff @ 5 kHz.

Receiver

MODES USB, LSB, CW, FSK/AFSK, AM, (FM optional).

	FREQUENCY MHz	.1 - 1.6	1.6 - 29.999	
SENSITIVITY	MODE			
	SSB, CW, RTTY	.5 μV	.15 μV	10 dB S/N @ 2.4 kHz
	AM	3.5 μV	1.0 μV	10 dB S/N @ 6.0 kHz
	(FM)	1.0 μV	.30 μV	12 dB SINAD @ 15 kHz

	SELECTIVITY FILTER	−6 dB	−60 dB
SELECTIVITY	STANDARD	2.4 kHz	3.36 kHz
	AM	6.00 kHz	11.25 kHz
	OPTIONAL	1.80 kHz	2.90 kHz
	OPTIONAL	.50 kHz	1.40 kHz
	OPTIONAL	.25 kHz	.85 kHz
	(FM)	15 kHz	30 kHz

Table 1

Power Output Versus Frequency

Frequency (MHz)	Adjustable Power Output (Watts)
1.80 - 2.01	18 - 100
3.50 - 4.01	18 - 100
7.00 - 7.31	18 - 95
10.10 - 10.16	18 - 95
14.00 - 14.36	17 - 100
18.06 - 18.18	17 - 95
21.00 - 21.46	18 - 95
24.80 - 25.10	18 - 105
28.00 - 29.71	18 - 100

Table 2

MHz first IF frequency.

Noise Blanker: A true I.F. type with adjustable width control.

Dynamic Range and 3rd Order Intercept Point: very excelent values especially considering that they are quoted with the receive preamplifer in use. Details will be discussed later.

Pass Band Tuning: True I.F. control which functions as a variable bandwidth control (±1.2 kHz) with the standard 2.4 kHz or optional 1.8 kHz IF filters and as an IF shift control with other IF filters.

Audio Bandpass Filter: As its name states, an audio filter. One can set the center frequency anywhere from 220 to 1700 Hz and then independently adjust the bandwidth, pulling it in or spreading it out from the center frequency selected. An interesting feature which combined with the audio notch filter equates to having a rather complete built-in accessory audio filter which is active in any receive mode.

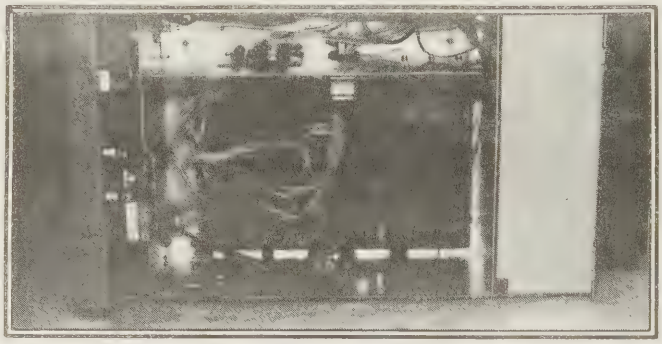
Again, I would suggest that one muse a bit over Table 1 if one seriously considers investing in a Paragon. The specifications are detailed enough to be quite meaningful and, as bench checks proved, quite accurate.

Circuitry

Fig. 1 presents a block circuit diagram of the PARAGON. Depending upon what one considers a true signal path IF signal conversion, one can consider the Paragon to be a triple or quadruple conversion design. The point is not really very important; the 75 MHz first IF feature is the key design feature of the transceiver which allows for general coverage receive and general coverage HF transmit.

Looking at fig. 1, one can generally trace the receive signal flow from the 1st Mixer block to the 2nd Mixer block to the filter block (lower right hand corner) and then over to the IF/AF block where detection, AF filtering and audio amplification takes place. The transmit signal flow path starts in the upper right hand block where a DSB signal is produced and then goes to the 2nd Mixer board to produce a filtered SSB signal and then on to the 1st Mixer board where the signal is translated to the output frequency. The signal is then amplifier in part of the Low Level Driver (L.L. DRV) board and Final Amplifier block to the 100 watt level. The 8 high-pass filters associated with the receive input are diode switched and the 7 low-pass filters associated with the transmit output are realy switched.

Overall, the basic signal flow paths in the PARAGON are the same as one finds in any general coverage transceiver. Transceivers do differ, however, in the ways that design engineers divide up the necessary signal processing and generation functions among various PC boards. Large PC boards mean more economical production but the danger of signal "glitches" and undesired interractions. Multiple, smaller PC boards mean a lot of costly interconnections. Ten-Tec has tak-



With the bottom cover removed, this is the lower half of the inside. The large board is the logic board. The two unused connectors on it are for the voice readout and RS232 interface options. The RAM/ROM board is plugged in just to the left of the unused connectors. It contains a socketed EPROM which can be exchanged if the software for the transceiver is ever revised.

This is the upper half of the inside. The boards shown are the low level driver, TX audio and sidetone. There are still other boards concerned with the oscillator circuits in the shielded compartment underneath the middle, low level driver, board.

en its own approach but, as one can note from fig. 1, they have been careful to separate various of the PLL and oscillator boards.

Construction

The PARAGON features almost total aluminum frame construction with an extruded aluminum front panel, multiple aluminum internal chassis sections and textured covered aluminum top and bottom covers. The construction is lightweight (16 lbs. or 7¼ kg) but yet very rugged. It should be almost totally immune to environmental factors no matter where in the world it might be used.

The photographs I made try to illustrate some of the constructional features but, in reality, they do a better mediocre job. There are a total of 14 glass-epoxy, double-sided PC boards and 9 glass-epoxy, single-sided PC boards. All of them use connectors and any one can be removed without soldering. The front panel is hinged to provide access both to its hardware and to the chassis sections behind it.

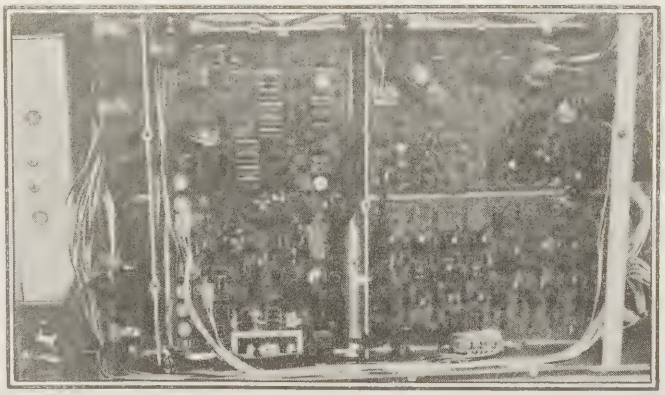
Taking off the top cover (see photograph) and looking inside the unit, one is immediately impressed by the quality of the construction and the spacious layout. Apparently a lot of thought was given to making the unit service-friendly such that one doesn't need a super detailed "roadmap" to find components and, if necessary, to remove or test them.

With the top cover removed one can see the large logic board, the low-level amplifier board, the TX audio board and the sidetone board. The shielded compartment to the rear enclosed the power amplifier. Removing the bottom cover, one sees the mixer boards, filter boards and the IF/AF board. The components associated with the PLL's and frequency synthesis are in separately shielded areas. The cable dressing is extremely neatly done. Overall, I would rate the construction "top quality."

Checking It Out

Jumping ahead a bit let me say that the transceiver is easy to operate but to technically check the functioning of some 12 analog controls and some 52 switches or pushbutton controls took a bit of time. But, it was done and every control and indicator performed perfectly.

On the *transmit* side, Table 2 presents the power output measurements. Third order intermodulation products (two-tone test) were −33 dB down (−39 dB for fifth order). Carrier suppression and unwanted sideband suppression were outstanding at slightly less than −60 dB. A look at a spectrum analyzer revealed no spurious or harmonic emission greater than −50 dB. Use of the speech processor on SSB about doubled the average power output level. At 90-100 watts power out-



With the bottom cover and an internal overall bottom shield removed, this is the lower half of the inside. The 2nd mixer board in the middle contains the 8 pole 2.4 kHz SSB filter and 6 pole 6.0 kHz AM filter. The power amplifier is to the left in another separately shielded enclosure.

This is the upper half of the bottom inside. The large board in the middle is the passband tuning one. It contains the standard 2.4 kHz filter (left side) which in conjunction with the SSB filter on the 2nd mixer board, provides 16 poles of SSB filtering. The other filters to the right of the SSB one (all plug-in) are the optional 8 pole 1.8 kHz filter, the optional 6 pole 500 Hz filter and the optional 6 pole 250 Hz filter.

Filter Specification

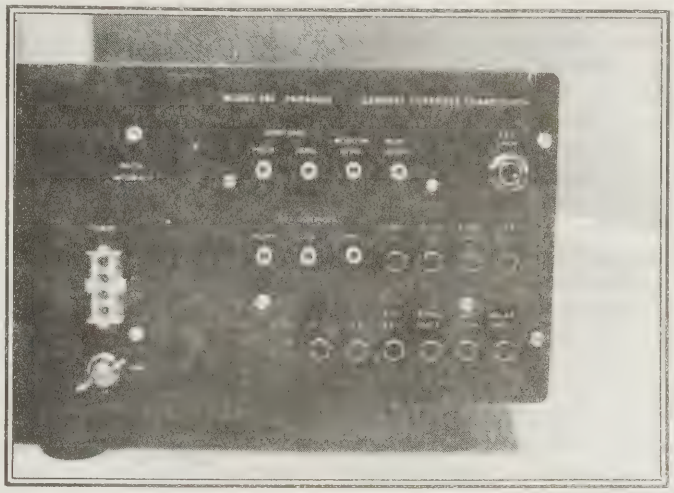
Filter	−6 dB Bandwidth	−60 dB Bandwidth	Shape Factor
AM	6.0 kHz	11.25 kHz	1.88:1
SSB	2.4 kHz	3.36 kHz	1.87:1
SSB (Optional)	1.8 kHz	2.90 kHz	1.80:1
CW (Optional)	500 Hz	1.4 kHz	2.80:1
CW (Optional)	250 Hz	850 Hz	3.40:1
FM	15.0 kHz	30.0 kHz	2.00:1

Table 3

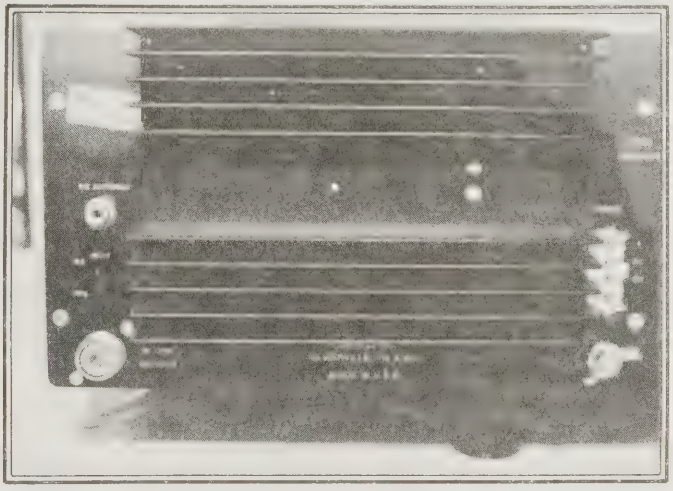
S Meter Response

Standard	Filter Used	20 Meter	10 Meter
S9,50 uV	250 Hz	S8½	S8
	500	9	8½
	1800	9 + 3dB	9
	2400	9 + 2dB	9
	6000	9	8½
S5,3 uV	250 Hz	S5½	4¾
	500	5¾	5
	1800	6	5
	2400	6	5½
	6000	6	5¼
S3,0.8 uV	250 Hz	S3½	S2¾
	500	3½	3
	1800	4	3½
	2400	4	3½
	6000	4	3¼

Table 4



The right side of the rear pane. A very clean and logical layout of various connectors and seldomly used controls.



The left side of the rear panel. It contains mainly the large heat-sink for the power amplifier. There is no fan. None is necessary for normal usage of the PARAGON.

put from a cold start the transceiver was run 20 minutes key-down before I felt the heat sink for the output transistors was getting too warm to tolerate. But this is within the rating specified and one must remember that the transceiver has no internal cooling fan. For normal operation this poses no problem whatsoever but for extended contest or key-down mode operation, an external fan would give one more piece of mind and prevent the transceiver from tripping off during the middle of a QSO as its protective circuitry was activated. Overall, on the transmit side, the transceiver produces a very stable and clean output signal.

On the receive side, the PARAGON has features galore. The actual operating features which will be described in more detail later, nicely complement the excellent technical performance. No matter how you like to look at the "numbers," the transceiver has a low-noise design with an excellent "front-end." I measured the noise floor at −138 dBm (2.4 kHz bandwidth) and the Third Order Intercept plotted to +18 dBm with the RF preamplifier in use and +35 dBm with the input attenuator activated. Table 1 presented the claimed sensitivity measurements and they all checked as good or better than specified (except FM since the FM option was not available). The same is true for the filter selectivity measurements as shown in Table 3. Although the standard 2.4 kHz SSB filter has a good shape factor, that of the 1.8 kHz is really interesting and recommended for DX'ers. The ultimate rejection of the filters is between 90-100 dB! Image and IF rejection were as good as claimed. The S meter calibration was "right on" with S9 being 50 uV and S3 about 0.8 uV. In fact, the S meter response was so good I decided to detail it a bit as shown in Table 4. It's rare to find a transceiver that isn't 3-4 S units out of calibration, especially on 10 meters. The calibration I show in Table 4 for S3, S5 and S9 refers to a Recommendation developed at the 1981 IARU Region 1 Conference. The squelch operates on all modes. The pass band tuning, notch filter and tunable audio bandpass filter form an interesting trio to combat QRM and although the numbers shown in Table 1 are correct, the usage of these controls can only be appreciated in practice. Receive recovery time was a hair under 30 ms making the transceiver usable in this respect for AMTOR operation. Keying rise and fall times were under 5 ms. The keyed signal exhibits the usual Ten-Tec quality. There is an internal CW waveshape control in case one has some special reason to change the keying response. Overall, receive specification are totally state-of-the-art and impressive even forgetting for the moment all of the unique operating features which translate the technical excellence into a user-friendly transceiver.

Interface Connections

The microphone input of the PARAGON will accept high (22K ohms) or low impedance microphones, non-amplified or amplified types, with a minimum out-

put of 5 mV. Crystal microphones with typical impedances of 100K ohms might be a problem. A standard 4 pin microphone socket is used; one of the pins provides a polarizing voltage in case an electret microphone is used.

The rear panel connections and functions are very extensive, as shown by one of the photographs. Just about every possible external interconnection possibility has been provided although no complex or unusual connectors are used. Generally, complete connections are provided for use with a linear amplifier, VHF transverters, a phone-patch, PTT foot switch, AFSK/FSK modems and a separate receive antenna. An auxiliary 12 VDC connector is provided for accessory items.

The VOX controls (delay, gain and anti-VOX) are all located on the rear panel as well as the controls for sidetone level and pitch, transmit audio monitor level and beep/voice level. The latter control refers to setting the level of an input confirmation beep for front panel keypad entries or to the output level of an optional voice synthesized frequency announcing IC. The concentrated, but not crowded, grouping of these controls on the rear panel of the transceiver is a very practical idea. They are normally controls that one would adjust only infrequently but, certainly, having them concentrated in one area is superior to having them spread out on the side, back or bottom panels of a transceiver and/or having them being recessed controls which require a screwdriver for adjustment.

Computer control (RS 232 Interface) interface information was not available at the time that this review was written. The optional Model 258 Interface Option Package is supposed to include a plug-in PC board that contains all of the necessary driver and interface circuitry, an RS 232 connector, connecting cable and complete command code information. All keypad functions and the main tuning circuitry can be controlled, according to Ten-Tec.

(To Be Continued)

CQ REVIEWS:

Ten-Tec's Paragon HF Transceiver

Part II — Operating Features

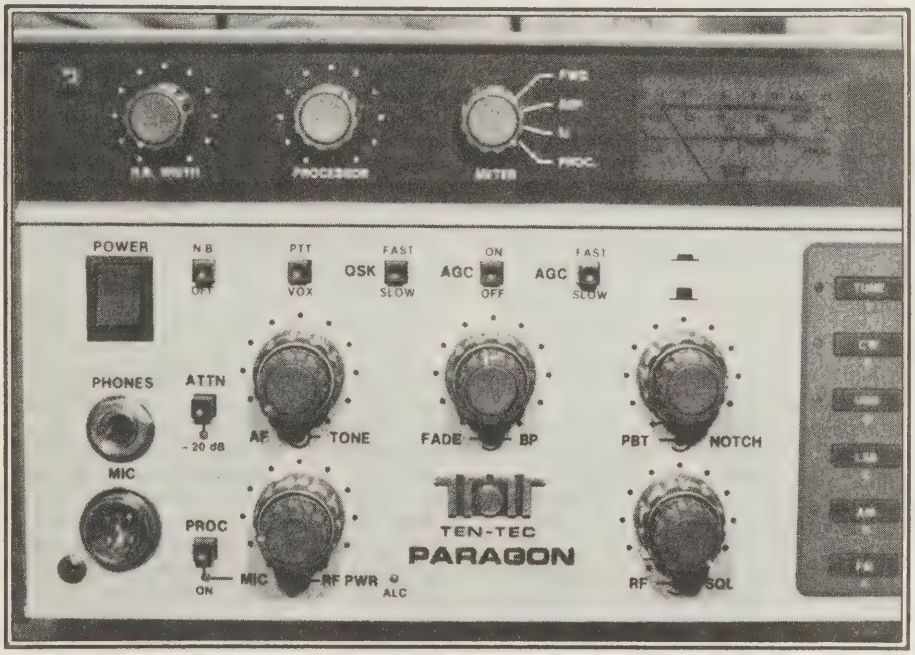
BY JOHN J. SCHULTZ*, W4FA/SV0DX

The Paragon's front panel measures about 5¾" × 14¾". All of the controls, indicators, and switches are widely spaced, and you need not worry that if you adjust one control another nearby control might inadvertently be moved. All controls including the main tuning knob have a very smooth feel to them. In spite of the fact that the front panel of the Paragon contains enough knobs, switches, and LED indicators to rival an airliner cockpit, everything is very simply and logically arranged. The transceiver, in fact, is very simple to operate and enjoy once you just take the time to appreciate the basic grouping and functioning of the controls. The grouping of the controls and indicators can basically be divided into the mostly analog ones (to the left of the main tuning knob), the analog meter and digital displays above the main tuning knob, and the large array of pushbutton switches and LED indicators on a raised panel around the main tuning knob.

Left Side Panel

The controls located here are those which, more or less, are found on most transceivers. They include controls for noise blanker width, speech processing level, AF gain/tone, AF selectivity tuning, passband tuning, notch tuning, microphone gain, RF power level, RF gain, and squelch level. There are switches for the meter function, noise blanker on/off, PTT or VOX selection, QSK fast/slow, AGC fast/slow, attenuator in/out, and speech processor on/off. There are LED indicators associated with the latter two switches, plus a separate LED indicator for ALC level. Finally, there are the microphone and headphone connectors plus an on/off switch for an external power supply. A photograph shows the layout of the left side panel.

The functioning of most of these controls is fairly obvious, although it might be worthwhile to highlight a few features. The meter selection switch allows monitoring via the analog meter of forward power (peak reading when SSB is used), reflected power, final amplifier collector current, and speech processing level. All this is very logical, but note that there is no ALC scale on the meter. ALC peak indication is provided by an LED located to the right of the microphone Gain/RF power output level control. It's a far better idea than having an ALC scale on the meter, since there hardly would be any point to having the ALC set to less than its effective operating point. Also, the arrangement allows you to check the ALC level and processor level *simultaneously* when speech processing is being used—a very convenient feature.



The left or "analog" side of the front panel on the Paragon.

The attenuator switch effectively bypasses the receive RF preamplifier. The LED indicator below the switch provides a very clear indication that the "attenuator" has been activated.

The control marked **FADE/BP** will be a new one to most transceiver users. The controls are for a built-in tunable audio filter. The **BP** control (bandpass) controls the center frequency of the filter which is continuously tunable over 220 to 1700 Hz. The concentrically located **FADE** control is really more of a bandwidth control. For any given frequency setting of the BP control, the FADE control pulls in the AF filter skirts from a flat response to a moderately sharp one. Both controls are effective in any mode of reception. They can almost eliminate the need for an optional CW IF filter for the *casual* CW operator and enhance SSB reception under QRM conditions. The use of the controls is also quite useful for general shortwave broadcast station reception when trying to eliminate various forms of QRM.

The PBT (Pass Band Tuning)/Notch control is the main selectivity feature of the Paragon. The PBT control adjusts the bandpass of one shiftable IF crystal filter in relation to the bandpass of a fixed IF crystal filter. In effect, the IF fixed and IF shiftable bandwidths slide or shadow over each other such that a variable bandpass is produced. The pass-band tuning control covers ± 1.2 kHz. This equates to less than a 1 kHz bandwidth being available for CW. This is certainly adequate for casual CW operation, although more devoted CW buffs will want one of the optional CW filters. For RTTY, the standard filter using the PBT controls can be nicely set to pass just the 2295 and 2125 Hz tones. The Notch control covers from 250 to 2200 Hz and is very effective with a deep, clean notch throughout its range. It can easily take a tune-up tone out of an SSB transmission to preserve perfect copy, for instance. It has a slight de-

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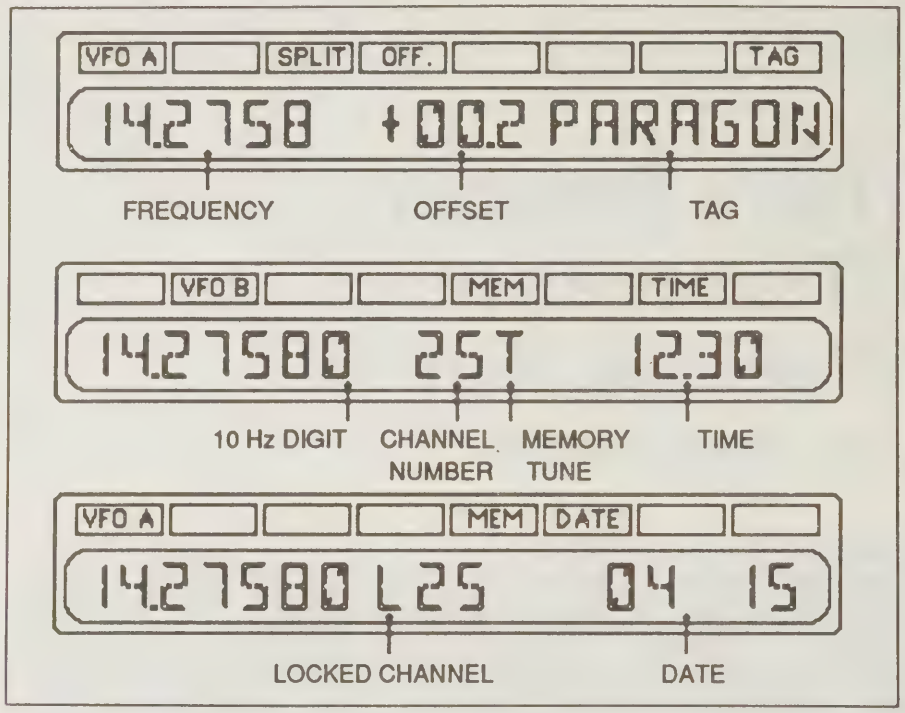


Fig. 1– This diagram illustrates just about all of the displays possible. You have to imagine that the large display is a soft fluorescent green color while the annunciators above are a backlighted yellow. The one display that is not shown is the one that will tell you which software version on an EPROM is installed in a Paragon.

sign fault, in my opinion, in that no on/off switch is associated with it. You must turn it fully CCW to effectively remove it. This is a plus in the sense that it is always ready to use, but on the other hand if you forget that the control is set at midrange, for instance, you might have to think for a moment or two as to why an SSB signal sounds a bit odd.

The Microphone/RF Power controls are straightforward. An LED indicator signals that the processor switch has been activated. The concentric RF Gain/Squelch controls carry forward the Ten-Tec idea of trying to keep the AF and RF gain controls separated, as most CW users would prefer. The squelch is operative in all modes and can be set for a sensitivity of down to 0.5 uV.

Indicators

The analog meter is nicely placed to the left of the main tuning knob such that one can easily glance at it or at the digital display. The meter is softly backlighted, and its scales are easy to read and checked out quite accurately. One might note, however, that the SWR scale readings are true only with 100 watts carrier output.

The digital display is a soft green fluorescent type. It looks simple enough, but in fact it has an extraordinary range of display functions. Fig. 1 presents a diagram of most of the display possibilities. There are eight annunciators above the digital display to indicate whether VFO A or VFO B has been selected, if Split frequency operation is being used, if Offset tuning is in use, if a Memory channel has been called up, Date if the date is called up, Time if time is called up, and Tag if you are entering memo information.

The left side of the digital display always indicates frequency (VFO A, B, or memory). A front-panel key selects, at will, if the readout should be to 100 or 10 Hz. The center display concerns itself with offset tuning information if either receive or transmit offset tuning has been selected (only one offset function can be used at a time). The display will indicate from +99.9 kHz to −99.9 kHz, a uniquely broad offset tuning range. In fact, for many split-frequency operations it obviates the need to get VFO A/B operation involved, thus adding a new dimension of versatility (a quality which is evident throughout the transceiver's design). The center display will display the memory channel number when a memory channel is called. Each memory channel stores frequency, mode, filter selected, and the alphanumeric tag. A display of all of these parameters comes up on the digital display and on LEDs when a memory channel is recalled. Besides channel number, the center display might indicate an **L** or a **T** to the left or right of the channel number. **L** means that the memory channel is locked out or bypassed during memory scan. **T** does not refer to a specific memory channel; it means that the main tuning knob is being used to tune through each of the programmed memories (including those locked out from scanning).

The Tag display is an other unique feature of the Paragon. Essentially, it's an electronic notepad. It can be used with either VFO, and a separate tag can be stored in each of the 62 memory channels. The uses for it, especially with the memory channels, are almost limitless. You can store next to a frequency the name of a net, alternate frequencies, an operator's name, a DX station's call, beacon locations, etc.—whatever you can make up using seven space locations, where each space location can contain any letter of the alphabet or any number from 0 to 9. A bonus feature of the tag display is quite interesting. The instructions for the microprocessor which controls the Paragon are stored in an EPROM. As more and more Paragons are produced and used, Ten-Tec many improve the EPROM software to add updates, improvements, and even better features. By some simple keypad entries, the tag display can be commanded to display the version number of the EPROM installed (e.g., VER 3-0). If an updated EPROM becomes available, and you feel it is worthwhile, you plug in the updated EPROM and the tag will display the version number installed—nifty modernistic feature, to say the least.

Mode	Normal	Normal Shifted	Fast	Fast Shifted
CW/SSB/FSK	4.8	9.6	9.6	24
AM/FM	24	48	49	240

Table I– Tuning rates, kiloHertz per turn of the main tuning knob.

Main Tuning Field

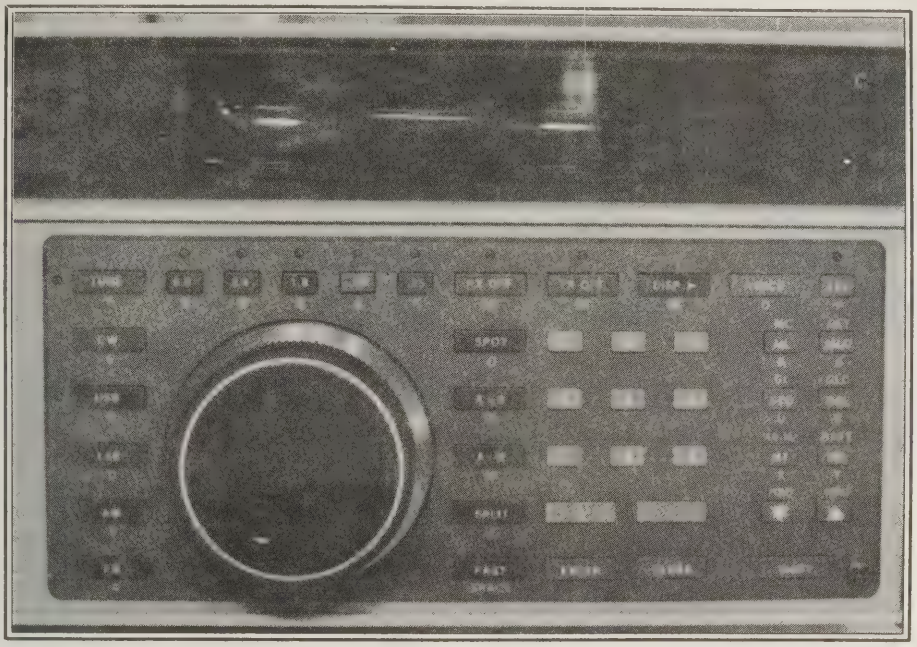
The main tuning field is dominated by the main tuning knob and then a large array of pushbutton or keypad switches and many LED indicators. A photograph illustrates the field.

First, as to the main tuning knob. It is slightly over 2 inches in diameter (excluding the metal skirt) and has a rubberized, textured, non-slip surface. There is also a convenient, recessed finger-tip indent for fast tuning. As with any transceiver, describing the tuning "feel" becomes quite subjective. So, rather than try to make superfluous statements, I would only say that the tuning "feel" is, by far, the best I have found on any Ten-Tec transceiver and extremely smooth. It's responsive yet comfortable to use for protracted operating periods.

The tuning rate depends upon both a key entry (normal, unless a fast option is chosen) and a shift feature which automatically increases the tuning rate when the main tuning knob is spun at a fast rate, regardless of whether the normal or fast tuning mode was selected. The various possibilities are summarized in Table I. I found the 4.8 kHz per turn rate to be excellent for normal SSB or CW operation, and when I wanted to shift quickly to a radically different part of a band, I found that selecting a different mode *temporarily* (e.g., AM) provided a quick, comfortable frequency change and was easier than spinning the tuning knob at a fast rate in the SSB mode. Only one-hand operation is required.

The reason why the just-described frequency change method was easy to use sort of leads me into the description of the very functional and easy-to-use keypad and LED display field around the main tuning knob.

The keys for mode selection (CW, USB, LSB, AM, and FM) are all very obvious to the left of the main tuning knob. A green LED indicator is associated with each key. Centered above the main tuning knob are keys marked 6.0, 2.4, 1.8, .50, and .25 with associated green LED indicators. These keys easily choose the various IF filters (6.0 and 2.4 kHz are standard; other filters are optional). To the top of the mode keys and to the left of the filter keys is a very functional one marked TUNE with an associated LED. Pressing the key automatically puts the transceiver into the CW mode and closes the PTT line. The protective circuitry keeps the



The right or "digital" side of the front panel.

output power at a suitable level if you have to adjust an antenna tuner, and the power output will rise to its full level as the SWR level falls below 1:1.5. Alternatively, any level of power output below the full value can be set by adjustment of the RF Power control. One presses the key again to return the transceiver to whatever mode it had previously been set up to use. It's an extremely convenient tuning method.

To the right of the main tuning knob are various keys associated with offset tuning and the use of the dual VFOs. Most of them are quite self-explanatory. The RX and TX offset keys activate those functions and each has an associated LED. The A/B and Split keys provide switching between either VFO, equalizing the frequencies in each VFO and setting up split operation such that one VFO controls the receive frequency and the other VFO controls the transmit frequency. Split operation may be in-band or cross-band. An interesting bonus is that when you use the main tuning while the split feature is activated, only the frequency displayed (VFO A or B) is changed.

The SPOT key allows you to zero-beat the transmit signal with the received one in CW.

The keys marked 1 through 0 and the decimal point one (.) simply provide for direct frequency entry and will be touched upon later.

If we quickly jump to the keys marked HBD, HBU, and SHIFT at the lower right edge of the panel, you can appreciate the simple yet sophisticated bandswitching operation of the transceiver. When the FAST tuning key is off, the HBD or HBU keys move the displayed VFO frequency up or down in continuous 100 kHz steps. If the FAST key is on, the step amount is 1 MHz. If the shift key is activated, the HBD/HBU keys will move the transceiver continuously up or down through the amateur bands only until one of the keys is released. The less obvious advantages of this particular bandswitching scheme really can only be appreciated when you actually use it. For instance, for normal amateur band operation you can switch between amateur bands as desired (SHIFT key on) and then when you are within a desired band, use the HBD or HBU keys (FAST key off) to get immediately to the desired 100 kHz portion of a band. It's immensely convenient compared to the endless manipulation of the main tuning knob required on many trans-

ceivers to get, for instance, from the SSB portion of 10 meters to the FM portion of the band.

If you are comfortable with understanding just the basic features of the Paragon, the foregoing description should be sufficient to illustrate that the Paragon is an extremely versatile and unique transceiver. It really is an easy transceiver to operate and has a tremendous array of advanced features most of which are easily controlled by the keys to the extreme right of the main tuning field. All of the keys are easy to use and understand. A "blow by blow" description of each key would probably not prove too much, so I will just highlight a few of the features.

• **Storing information in a memory channel.** You set up the frequency, mode, VFO (A or B), and filter selection. Then you press the STO key and the desired two-digit memory channel number. All the information described will be stored. If you don't know which channel number to use, press the STO key followed by the ENTER key. The transceiver will automatically choose the next available memory channel, *and* the display will then show the memory channel used! The notation FULL will be displayed if all memory channels are full, since you then have to erase a memory channel if new entries are to be stored.

• **Recalling a memory channel.** This operation is extremely simple. Just press the RCL key and then from the numeric keypad the two-digit memory channel number. You can recall any of the 62 memory channels in this manner. If the main tuning knob is adjusted during recall, the memory frequency is immediately transferred to a VFO and it becomes completely tunable. If you are within an amateur band, transmit operation is immediately available.

• **MT (Memory Tune).** When this function is used, the main tuning knob controls the manual selection of all of the programmed memories. It sounds like a simple control, but in fact it can be extremely useful and powerful. Depending upon how you have programmed the memories, you can check various amateur bands, beacons, SW broadcast stations, etc., in an extremely quick fashion. I think a DXer will find it to be a very powerful tool.

• **Scratch Pad Memory.** This function provides a method by simple key manipulation whereby you can temporarily store and recall a single frequency without affecting any memories. Entering a new frequency erases the previous entry.

• **Memory Scan.** The transceiver will scan through all of the memory channels except those which are locked out. The length of time that the transceiver stops at each memory location is adjustable. A RATE key allows you to choose from 10 different scan rates, ranging from a few seconds' hold on each memory channel to a very fast sweep. Scanning must be manually stopped.

• **Memory Lockout.** You can simply lock out from scanning any given memory channel or sort of do the reverse. That is, you can temporarily lock out all of the memory channels and then just selectively unlock several desired channels. None of the information in memory is changed during these operations.

• **Frequency Readout.** One key function determines if the frequency readout will be down to 10 Hz or 100 Hz.

• **Tag Entry.** You might note that many keys have a single letter as a sub-label. The function of those keys can be shifted temporarily to allow the entry of any letter for a frequency tag.

• **Frequency Entry.** Frequencies can be selected by the main tuning knob or by keypad entry. The keypad entry system is very straightforward. You simply punch in the frequency immediately and then press the ENTER key. Entering the decimal point tells the transceiver when the MHz portion of the entry has ended. Leading or trailing zeros do not have to be entered. It's so simple that I very often use it to bandswitch the transceiver.

The Paragon has a lot of powerful features and a lot of controls. However, I feel the controls are all logically and conveniently arranged. You might need a "crib sheet" when first using the transceiver, but after a few hours of trying out its features, it should no longer be necessary. All of the most often used controls are on the front panel. There are no hatch covers, recessed controls, etc.

Memory Retention

The memory-retention system used in the Paragon requires for normal operation that the transceiver continue to be supplied with power supply voltage when not being operated. (The front-panel power switch does not remove power to the logic circuits.) When the unit is being transported, an ordinary 9 volt alkaline battery can be installed and will provide about 150 hours of backup power. Of course, it can be left installed at all times to provide backup during AC line power outages.

The idea of having a power supply turned on all of the time may disturb some operators, but you should evaluate the situation. The Ten-Tec power supply draws 25–30 watts from the AC line on standby. That equates to a cost of 50 cents to $2.00 per month, depending on the kw/hour rate in your location. That has to be balanced against the fact that no special battery ever has to be replaced within the transceiver. There are alternatives such as using a 9 volt rechargeable battery which is kept under trickle charge or a separate 9 volt supply. However, I've had the Ten-Tec power supply "on" for months without any problem. Perhaps the idea doesn't disturb me because for years I've lived with transformers in broadcasting or power distribution systems that are never turned off and, in fact, have been "on" for over 30 years.

Part III of this article will be devoted to personal operating experiences and impressions concerning on-the-air use of the Paragon, plus a review of some accessories. CQ

(To Be Continued)

CQ REVIEWS:

Ten-Tec's Paragon HF Transceiver

Part III — Operating Results and Accessories

BY JOHN J. SCHULTZ*, W4FA/SV0DX

The Paragon tested (serial No. 00102) has been in almost constant use over a six-month period, usually with a Titan linear amplifier. All modes were used, but the concentration of operating time was on SSB. About the best understatement I can make is that the Paragon is suitably named. Starting with the first operating day, I had the impression that the Paragon represented a different class of transceiver, and that impression remains to this day.

If I had to find a few words to summarize my impressions about the Paragon, I would choose quietness, convenience, and punch. The quietness on receive has two main advantages: Weak signals seem to pop out of an almost totally quiet background for enhanced readability, and using the receive mode for extended periods does not become tiring. DXers as well as those who spend a lot of time just "listening to the mail" will appreciate its receive performance, especially since it is coupled with a very smooth main tuning knob action. Once you become used to the giant keypad around the main tuning knob, the convenient way it is laid out becomes more and more apparent. The keys that you are likely to use most often are grouped closest around the main tuning knob. One of the LEDs or some change on the main display alerts you to any status change of the transceiver. The analog controls have a firm but smooth feel to them. I would have voted for a slightly different arrangement of the controls, particularly grouping all of the selectivity-type controls more around the AF gain control, but that is strictly a personal preference.

The punch of the transceiver was amply demonstrated numerous times as I cut through the huge European pileups to work DX like 9V, 6W, and BY stations. At the same time, many stations, especially those from G-land, took time out to mention that my audio sounded strong and dominant, but not rough (I almost always left the processor turned on). One operator at HZ1AB summarized it best, I guess, when he simply commented that the audio sounded "superb."

With regard to CW operation, I received many compliments regarding the keying quality of the Paragon. I could only test the QSK up to 20 wpm plus because of my own operating ability. However, a single "dit" at 20 wpm would easily be discernable as I was transmitting so I could break my transmission to listen. I estimate the full QSK to be viable to at least 35 wpm for dyed-in-the-wool CW buffs.

I still haven't filled all of the 62 memories, but over a period of time I have entered quite a few beacon frequencies, broadcast frequencies, and DX net information. The tag display is immensely useful to keep track of net times and things like beacon locations. If you obtain some of the optional filters, you will rapidly appreciate the fact that although a memory will store filter and mode information, the filter and mode functions are completely switchable even after a memory channel has been recalled. Any filter can be selected in any mode (except FM where the 15 kHz one is automatically selected). Therefore, one can enjoy quasi hi-fi on SSB receive using the 6 kHz filter when conditions permit, at one extreme, and try to dig a shortwave broadcast station out of the QRM or noise using the narrow SSB filter.

Besides being a more than state-of-the-art radio from a technical viewpoint, I just plain found the Paragon to be a thoroughly enjoyable radio to use. It sort of in-

*c/o CQ magazine

Input Voltage: 109–125 VAC or 218–250 VAC, 50–60 Hz
Output Voltage: 13.8 VDC, internally adjustable from 11.5 to 15.0 VDC
Output Current: 20 amps full load, 22 amps maximum for 5 minutes
Current Limiting: Electronically disables output. Factory set threshold at 22 amps
Regulation: −3% at output connector for no load to 20 amps full load
Ripple: 20 mV peak to peak at 20 amps
Speaker Impedance: 8 ohms

Table I– Specifications for the Model 960 Power Supply/Speaker.

vites you to use it rather than present a front panel which challenges the operator to remember how to use it.

Manual

The manual supplied with the Paragon guides you very easily as to how to use its features. It initially gives installation guidelines which are complete enough except if you're using a full QSK amplifier. I did have to refer to the Titan manual also to get the interconnections to the amplifier correct. The manual then goes on to a one-page condensed operating instruction summary which is great. It quickly points out all the control settings and frequency selection methods so you can have the transceiver operating on amateur band SSB or CW within a very leisurely 5–10 minutes.

The next section of the manual is entitled "Detailed Operating Instructions," and this is where you really get to know how to use the transceiver. The information is conveyed rather neatly in little "tidbits." Small, logically connected groupings of the keys or analog controls are discussed in individual blocks, or some blocks may illustrate and explain just one key function or analog control. With the transceiver in front of you, all of the information is very easy to understand. Trying out all of the functions is quite interesting, and I would suggest that this part of the manual be digested in leisurely steps.

Other parts of the manual go on to give operating hints, what-to-do in case of trouble hints, options installation information, and circuit descriptions. The demand for the Paragon sort of overwhelmed Ten-Tec, and the latter section of the manual was not included with early production runs, although by now all owners of the transceiver should have received the complete manual.

I worked with preliminary copies of various diagrams, and it was quite evident that Ten-Tec was determined to get them complete and correct before incorporating them in the manual. The diagrams with which I worked contained quite complete information regarding things such as component identification and test-point voltages on each PC board. The information, overall, does not constitute a complete alignment and service manual. However, an experienced amateur can certainly use the diagrams to track down minor problems, if they should ever arise, or use them for technical communications with the Ten-Tec service people.

Options/Accessories

The filter options, mentioned previously, have been available since the Paragon

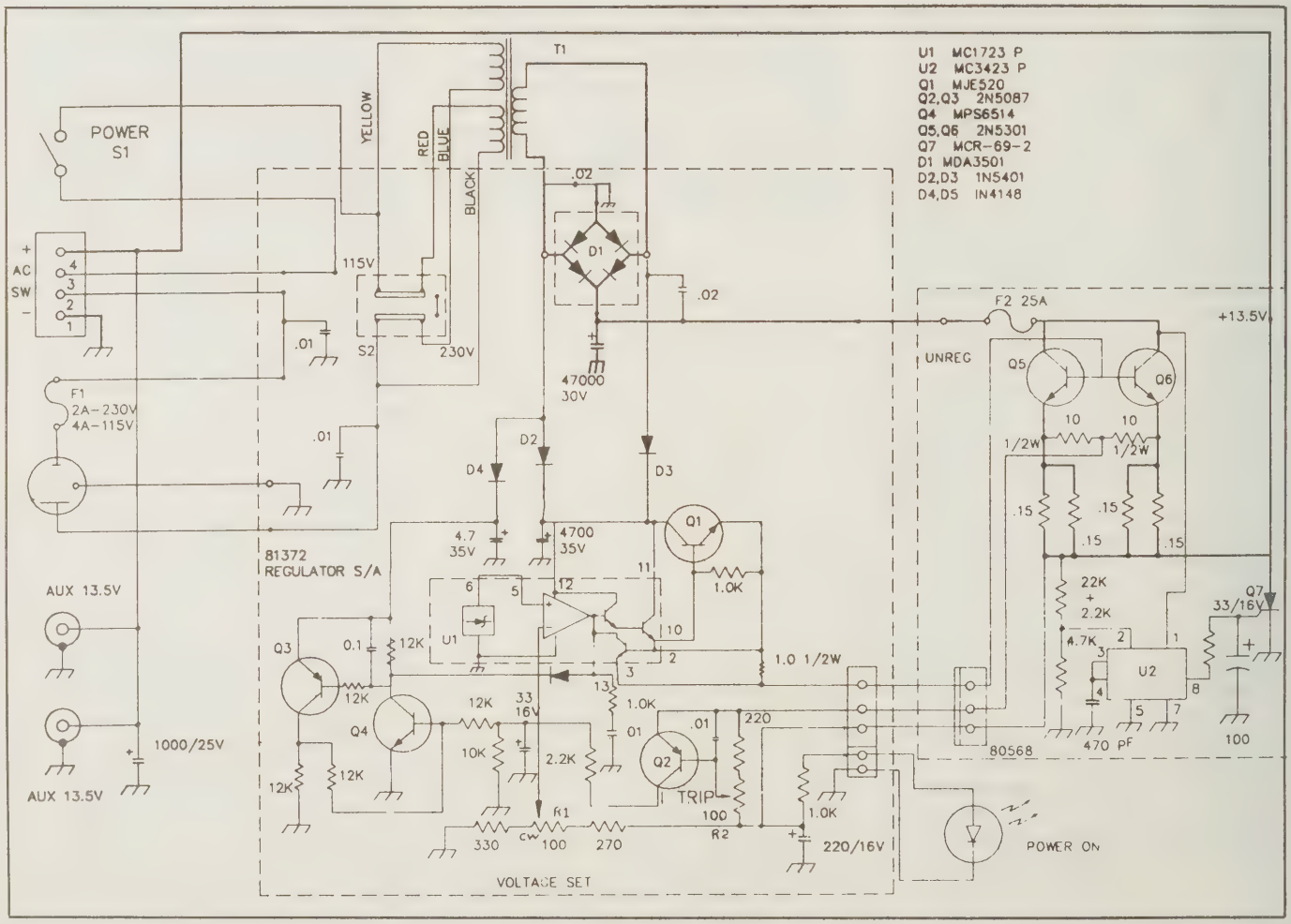


Fig. 1– Schematic of the Model 960 Power Supply.

was introduced. The Voice Readout, RS232 Interface, and FM Adaptor options were all held up from lot production due to the initial demand for the transceiver. They should be available now. The Voice Readut option, Model 257, announces the displayed frequency whenever the **VOICE** key is displayed. The output level is adustable. The RS232 Interface, Model 258, provides computer interface. It comes as a package that includes a plug-in PC board, RS232 connector and cable, and a listing of the command codes to access the Paragon's microprocessor. The FM Adaptor option, Model 256, is a PC board that locates within the transceiver near a synthesizer sub-chassis. It provides transceive ± 5 kHz FM deviation.

Two Ten-Tec accessories that were actually used with the Paragon that was tested were the Model 960 Power Supply/Speaker and Model 705 Electret Microphone.

The Model 960 Power Supply is a rugged unit that supplies 20 amps at 13.5 VDC (regulated) from a 115/230 VAC, 50/60 Hz source. Table I presents the specifications for the unit. You might note the wide input voltage acceptance range and the relatively "stiff" regulation even at 20 amps output.

Fig. 1 presents a schematic of the power supply. The in/out connections are quite standard, except that you might note that *two* auxiliary 13.5 volt output connectors are provided for accessory items. The basic circuitry revolves around D1, a full-wave rectifier, and two 2N5301 pass transistors (heavily heat-sinked) as controlled by U2, an MC3423P voltage regulator.

The circuitry has several interesting features which are more sophisticated than those evident in previous Ten-Tec power supply designs. Q3 and Q4 provide over-current shut-down action driven indirectly by the voltage drop across R2. When the output current exceeds 22 amps, the power supply will shut down until you recycle the on/off switch on the power supply (not the power on/off switch on the Paragon transceiver). The power supply also has over-voltage or "crowbar" protection. This type of protection dates back decades as far as broadcast transmitters are concerned, but it's not all that common in amateur designs. Basically, it's a protective circuit that *shorts* a power supply output when an over-voltage output condition takes place. The idea is that it's better to blow a power-supply fuse or have a circuit breaker trip than to damage an expensive transmitter or transceiver component. In order to be effective, a "crowbar" operation has to be very fast, and it certainly cannot be done unless a power supply is very carefully designed such that repeated overloads ("crowbars") activate only the protective circuitry in a power supply and do not cause damage to the main transformer or solid-state devices. The "crowbar" circuit (U2 and Q7) in the Model 960 does just that and is set at a threshold voltage of 15.9 VDC. Even momentarily high supply output voltages (e.g., those caused by a lightning strike near the AC power line feeding the power supply) will cause SCR Q7 to "crowbar" and either trip the over-current circuit or blow the line fuse (F1) or the internal fuse (F2, 25 amps). In any case, unless some *very* unusual voltage spike or current peak takes place at *either* the input or output terminals of the power supply, it is very well equipped to protect itself. The worst that can happen is that you will be faced with the minor inconvenience of replacing the line fuse (externally accessible) or the doubly-protective 25 amp fuse (internally accessible) or having to recycle the on/off switch to reset the overcurrent protective circuit.

The supply has a built-in speaker which provides a bit more "presence" to the received audio as compared to the upward facing internal speaker in the Paragon. The front-panel plexiglass window can easily be removed, and you can insert behind it a label of your own design to dis-

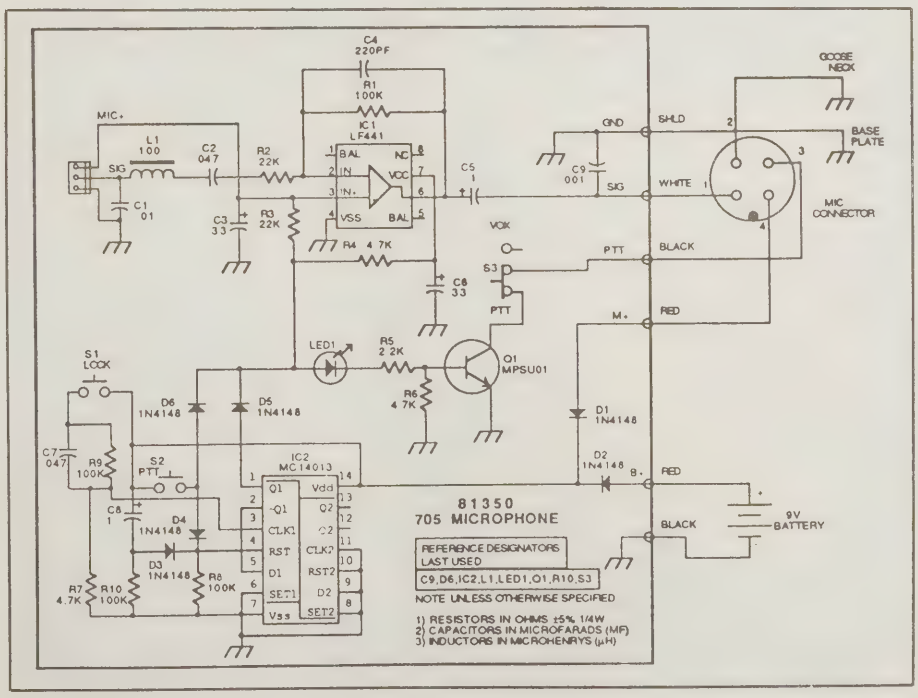


Fig. 2– Schematic diagram of the Model 705 Microphone.

play a station's call sign. Overall, the supply is extremely well designed, and it's hard to imagine how almost any sort of electrical abuse could damage the unit.

The Model 705 microphone is a very light-weight electret type. The specifications for it are shown in Table II. It is an amplified type of microphone, and its schematic is shown in fig. 2. IC1 is a low-noise preamplifier, while IC2 in conjunction with Q1 forms a latching/switching circuit to provide either for momentary or locked PTT operation via two key switches on the microphone. An LED signals that the PTT line has been grounded. The microphone can be powered by an internal 9 volt battery or directly over the microphone cable from most Ten-Tec transceivers, including the Paragon.

The unit is so light (about 8 ounces without a battery) that at first you tend not to develop too much respect for the unit. However, it is really a quite good microphone. I didn't do a frequency response run on the microphone, but I did audibly compare its response to that of several other microphones I had in the shack. The 705 has a clear, very intelligible response with, what I would call, not being bassy or overly crisp. I suspect it all comes about from a combination of the electret element itself plus a bit of frequency shaping as provided by the dimensioning of the components associated with the low-noise preamplifer, IC1.

Type: Electret condenser microphone Sensitivity: −52 dBv (0 dBv = 1 v/μBar at 1 kHz) Output Impedance: Works into any circuit of 100 ohms or more Maximum Sound Pressure Level: 130 dB Battery Type: 9 volt alkaline transistor battery Electronics: C-Mos PTT switch, C-Mos signal amplifier, NPN T/R transistor Current Required: Receive mode less than 2 microamperes; transmit mode 2 milliamperes typical, with 9 volt battery Semiconductors: 2 ICs; 1 transistor; 7 diodes Weight: 12 ounces including battery

Table II- Specifications for the Model 705 Desk Microphone.

If you do invest in a Paragon, I would also strongly advise considering the purchase of the 960 Power Supply and 705 Microphone.

Epilog

Through a rather inept move on my part, I had to call on Ten-Tec's service department. I tried to reposition the annunciator screen on the transceiver, but in the process the screen fell off. I had the feeling that I was turning a minor thing into a disaster, since I had the front panel partly removed to get at the screen, and I had also disconnected many cable leads.

I sent the transceiver back to Ten-Tec. Within ten days it was back. Not only had a new screen been installed, but the bottom internal cover had been replaced by an updated one, the transceiver had been realigned, a cold solder joint on an IF filter had been repaired, and the software had been updated to the latest version! There was no service charge. Now if that isn't top-of-the-line service for a top-of-the-line rig, I'm lost for words.

Here are some last-minute notes of interest. The Paragon now comes with a 100-plus page combined operating and service manual which is absolutely complete with detailed circuit descriptions, board circuit traces, component layouts, etc. Serial numbers 395 and above incorporate a 3 ma trickle charge to the 9 volt memory back-up battery so a nickel-cadmium type can be used. Earlier serials can be modified easily. Also, several options are now available as to how the "spot" button can be used via a programmed plug-in chip. It's all explained in the manual. CQ

CQ REVIEWS:

Ten-Tec's Titan Legal-Limit Power Amplifier

BY JOHN J. SCHULTZ*, W4FA

The increase in the linear amplifier legal power limit to 1500 watts *output* has resulted in a number of new linears coming on the amateur market. However, since the hefty 1500 watt output level is far beyond what can be handled by simple linears using sweep tubes, 811's, 572B's, etc., manufacturers of the new "super" power level linears have generally turned to ceramic/metal power tubes, notably those from the Varian/Eimac company. That has unveiled a rather quiet, but extremely significant revolution in modern-day power-tube design. Ceramic/metal power tubes now can combine very high power dissipation in a physically small package and yet have good power gain, low distortion, high efficiency, and very low filament power requirements. Anyone remember the 750TH?

Anyway, the reason for this prologue is not really to reminisce, but to indirectly introduce the Ten-Tec's Titan linear. It is a full legal power linear which utilizes two of the very newest Eimac ceramic/metal power tubes and is an excellent example of modern, compact, high-power linear-amplifier design.

The Titan comes in three shipping containers—one each for the linear-amplifier compartment, the power-supply compartment (minus the power transformer), and the power transformer itself. The only assembly work one has to do is to mount the hefty power transformer (it weighs almost 45 lbs.) in the power-supply compartment. The latter procedure involves unscrewing and rescrewing some 24 screws and/or nuts and bolts both to remove and replace the cover on the power supply and to bolt down the transformer. However, no wiring is required since the transformer has plug-in wiring connections. Two cables, both about 6 feet long, interconnect the power

Photo 1. The Titan in operation next to a Corsair transceiver. It's hard to imagine a 3 kw linear almost the same size as its matching transceiver.

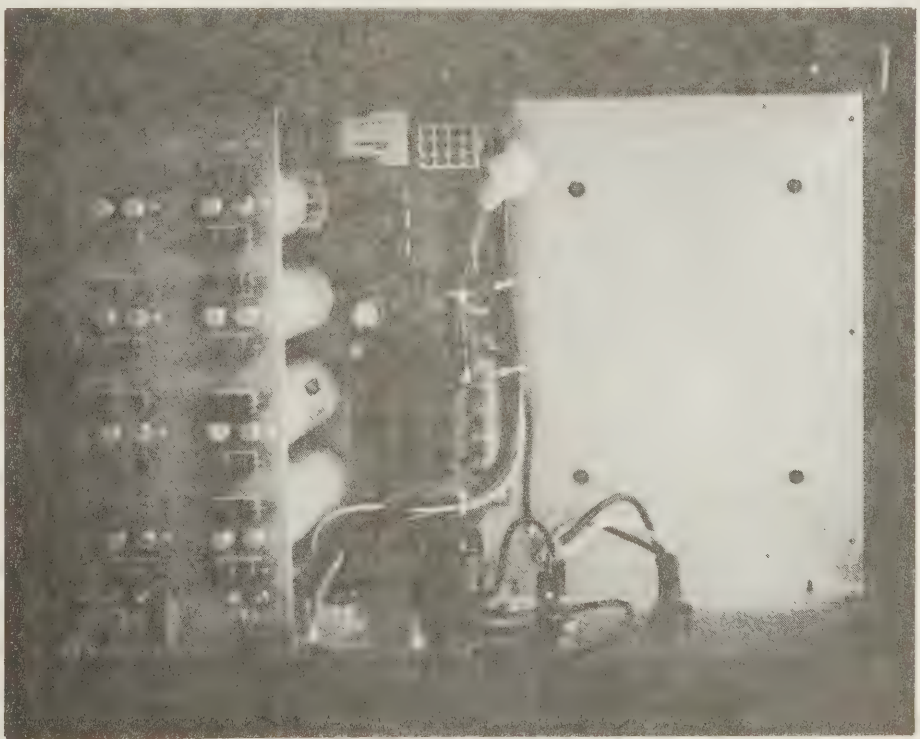


Photo 2. The inside of the power-supply enclosure before the power transformer is installed (a simple procedure).

c/o CQ Magazine

Photo 3. The 45 lbs. worth of power transformer as it comes shipped and before simple installation in the power-supply enclosure.

supply and amplifier so the latter can be conveniently located in a station setup. All operating controls and indicators, by the way, are on the amplifier so the power supply can be placed out of view. The power supply is wired for a 220 VAC line since it can draw as much as 4 kw of line power; 120 VAC operation is not recommended, but possible.

General

Table I shows the specifications for the Titan. Before going into an overview of its features, one might note the power input figures *vis-a-vis* the sizes and weights for the power supply and amplifier. The Titan packs a lot of RF power into small, relatively light-weight enclosures. The amplifier enclosure, for instance, weighs less than many transceivers. The reason this can be done is due primarily to the usage of the modern Eimac power tubes and, to a lesser degree, to a modern power transformer and compact filter capacitors in the power supply.

The Titan has a maximum SSB/CW power input of 3 kw (2 kw in continuous service) and requires less than 100 watts drive over its operating range. The latter encompasses all of the presently available bands authorized high-power operation, including 160 meters, although a 10 meter modification has to be installed to allow operation on that band. Ten-Tec has stated that it will make information available on use of the Titan on the 10, 18, and 24 MHz bands when linears are allowed on those bands. Full QSK (break-in) operation is possible at keying speeds up to at least 50 wpm. With an efficiency of 50–65%, the Titan will develop the full, legal 1500 watt output level in any mode. The input and output impedances are the standard 50 ohms. IMD products are rated at −35 dB, and harmonic rejection is rated a very respectable −50 dB.

In order to monitor various electrical parameters, the Titan uses an interesting combination of conventional metering and LED indicators. One meter is dedicated to reading plate current only. The other meter can be switched to read plate voltage, grid current, forward power, or reflected power. There are LED indicators for "overdrive," "operate," "stand by," or "wait." A 10-element LED bargraph display indicates peak power output continuously. The controls are straightforward and simple and, besides the meter switch, comprise the bandswitch, tune and load controls, and rocker switches for "on/off," "standby/operate," and "low/high" plate voltage.

SPECIFICATIONS
MODEL 425 TITAN AMPLIFIER

BAND COVERAGE: 1.8-2.0, 3.2-4.7, 6.5-8.5, 13.4-19.6, 17.6-23MHz. (Export model 425E covers 17.6-26.5 and 20.6-31.

MAXIMUM POWER INPUT: 3 KW, 2 KW CCS

DRIVING POWER REQUIRED: 100 watts, maximum, 65 watts typical.

EFFICIENCY: 50-65%, depending on load, frequency and drive level.

INPUT AND OUTPUT IMPEDANCES: 50 ohms unbalanced, VSWR 2:1 or less.

DISTORTION: −35 dB from 1 KW PEP rf output level.

HARMONICS: −50 dB, typical.

CW BREAK-IN: High speed QSK capability when using a QSK exciter.

TUBE COMPLEMENT: Two Eimac 3CX800A7 ceramic air-cooled triodes in grounded grid.

TUBE PLATE DISSIPATION: 1600 watts.

COOLING: Ducted forced air, vertical exhaust, using centrifugal blower.

METERING: Full time plate current. Switch selected plate voltage, grid current, forward power or reflected power. Peak power indicated on a 10 element LED bar graph display.

AUTOMATIC LEVEL CONTROL: Negative-going, adjustable threshold.

STATUS INDICATORS: Overdrive, Standby, Operate, Wait.

PRIMARY POWER: 220-250 volts @ 20 amperes, maximum.

TRANSFORMER RATING: 2.0 KVA CCS.

PROTECTION: Primary line fuses. Plate current fuse. Ac and high voltage interlocks engaged when cover is removed.

FRONT PANEL CONTROLS: Power ON-OFF; Mode (Standby-Operate); HV (High-Low); Plate Tune; Loading; Band Switch; Meter Switch.

SIZE: Amplifier: 5¼" H x 15¼" W x 15" D. (13.5 x 39 x 38 cm.)
Power Supply: 8¼" H x 13⅜" W x 10¼" D. (21 x 34 x 26 cm.)

WEIGHT: Amplifier: 17 lbs. (7.7 kg.)
Power Supply: 45 lbs. (20 kg.)

Table I– Specifications of the Ten-Tec Titan.

Circuitry

The basic circuitry of the Titan is shown in fig. 1. Two 3CX800A7 tubes are used in a grounded grid circuit. The tubes are directly cathode driven, hence eliminating the need for a filament choke, and have a tuned input circuit for each band. The plate output circuit is a double section P-L configuration which has two advantages—it increases harmonic reduction compared to a simple Pi-circuit and reduces the need for very large value loading capacitance values on the lower frequency bands. On the other hand, it does raise the voltage rating required for the variable loading capacitor in the Pi-L network and that is why, as one might note from some of the photographs, the loading capacitor has almost as wide plate spacing as the plate tuning capacitor. The plate voltage can be selected to

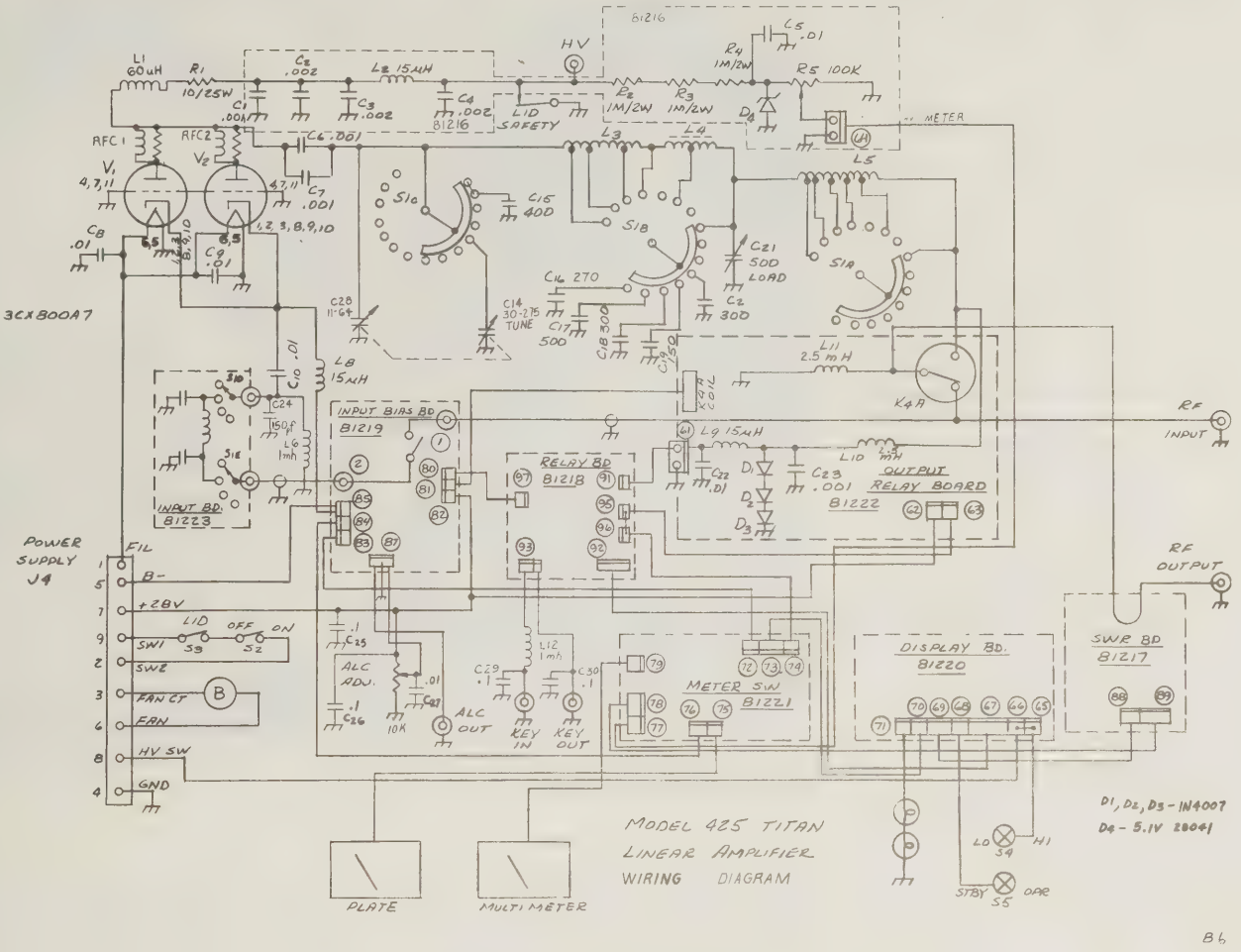


Fig. 1– Basic circuitry of the Titan.

be about 1700 volts (600 ma plate current) for 1 kw input or 2500 volts (1.2 ampere plate current) for 3 kw input. Two relays are used for antenna switchover in order to provide full QSK operation. Relay K4A is a special high-speed (2 ms switching time) vacuum relay which controls the main RF path while a smaller relay in the input bias board disconnects the tuned input circuits from the antenna line on receive so the circuits do not desensitize a transceiver's front end. The grids of the power tubes are biased with +8.5 volts during operation and with +28 volts during receive periods for cut-off. The rest of the circuitry—which provides for various control, status monitoring, and safety features—is spread out on a number of small PC boards. All of the design is really quite interesting and sophisticated, but just a few highlights concerning the ancillary circuitry will be covered.

The full QSK capability of the Titan requires that very fast transmit/receive relay switching be done while preventing the relays from "hot" switching (switching while RF energy is present). The speed with which the relays operate is largely a function of the relays' own physical and electrical characteristics. The vacuum relay used in the Titan will switch

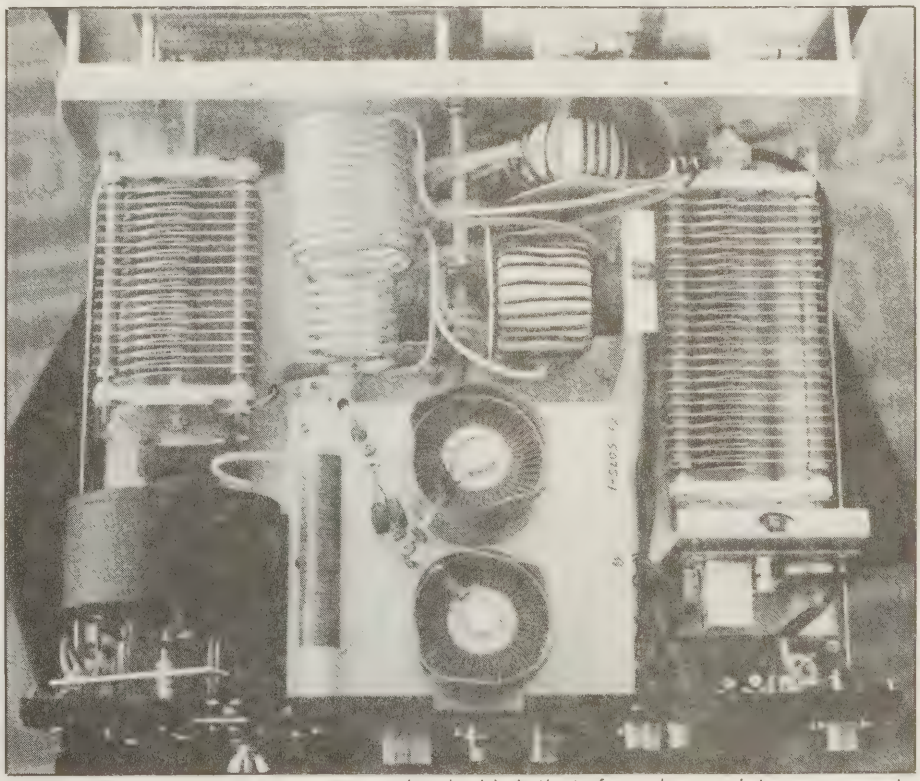


Photo 4. The amplifier compartment view inside is that of very heavy-duty components all centered around the elevated chassis for the two 3CX800A7 power tubes.

in 2 ms, and the other relays associated with the QSK feature switch in no more than 0.5 ms. The prevention of hot switching involves a chain of RF detection and control circuits. Basically, the circuitry first detects if there is drive present *before* key down. If not, the amplifier will switch to transmit and wait for excitation (keying). If drive is present, the amplifier will not switch to transmit. The circuit secondly detects if drive is present *after* the key is up. If not, the amplifier will switch to receive. If excitation is still present, the amplifier will remain in the transmit mode. The circuitry involves a number of steps in which several transistor switches are turned on or off or inhibited. However, much of the heart of the circuitry centers around the circuitry connected to the "input RF" jack shown to the left in fig. 2.

The base of Q4 receives control information from the RF detector (C4, D7, D10, etc.) and from a control line which has sensed if the key line is open or closed. If RF drive is sensed as being present, but the key line is sensed as being open, Q4 will clamp Q5 to ground, which in turn will prevent the closing of the transmit/receive relays. (K4, the vacuum relay, in fig. 1 and K3 in fig. 2). If RF drive is not sensed as being present, and the key line is closed, the amplifier will switch to transmit. When the key line is opened after transmitting a character a second RF detector (C5, D8, D9, etc.) determines if RF drive is still present. If so, it clamps Q3, in a similar manner to which Q5 was clamped before, and the rest of the circuitry prevents the transmit/receive relays from opening. If RF drive is sensed as not being present, the transmit/receive relays are allowed to open. Incidental, but still an important part of the overall switching action, is Q1 in fig. 2, which in turn controls the zener diode D2. In the transmit mode this diode establishes the operating bias for the amplifier tubes while in the receive mode Q1 opens and +28 volts cutoff bias is applied to the tubes.

The foregoing is a very simplified ex-

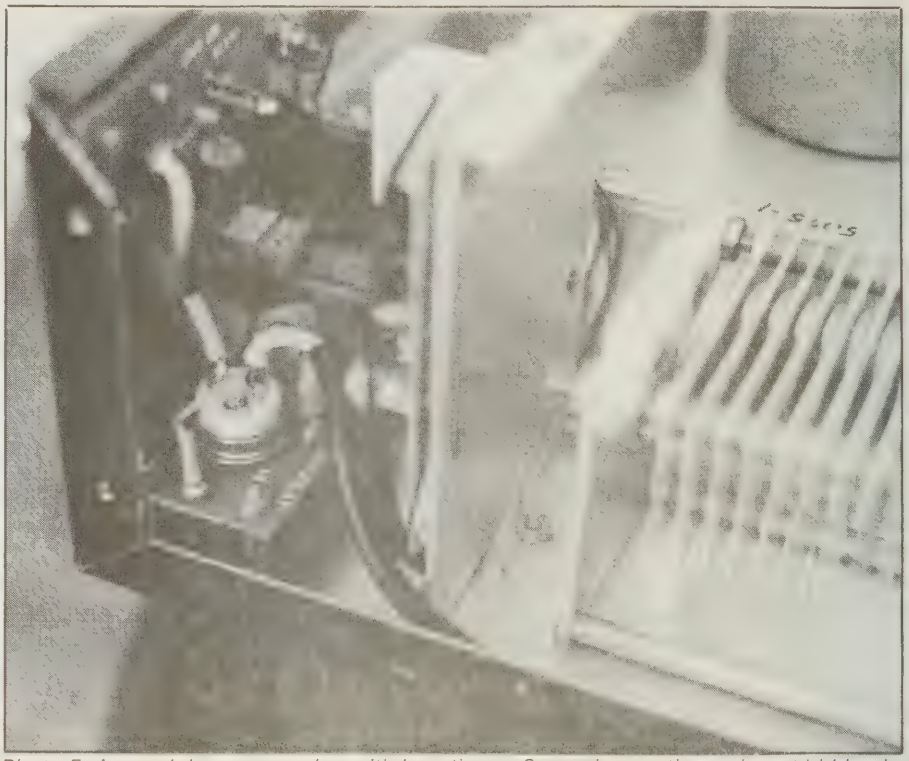


Photo 5. A special vacuum relay with less than a 2 ms closure time, almost hidden in the back of the Titan enclosure, is a main component of the full QSK system featured by the Titan.

Photo 6. Removing a bottom cover plate on the Titan shows the power tube sockets and the low-pass tuned input circuits. Air-pressure input from the fan shown in photo 4 would be from the right.

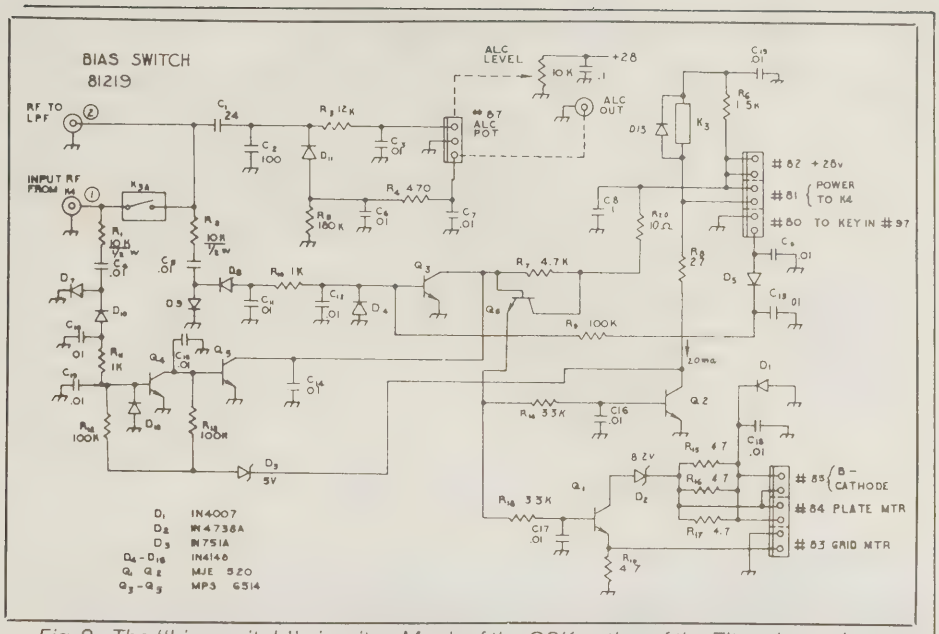


Fig. 2– The "bias switch" circuitry. Much of the QSK action of the Titan depends on circuitry on this board.

planation of some circuitry which Ten-Tec takes a page and a half in the Titan manual to explain. Nonetheless, it gives one some idea of the switching actions involved. The great trick, of course, is to arrange the switching circuitry and choose components so no unnecessary time delays are introduced by the QSK system. As far as the Titan is concerned, the limiting factor seems to be the closing time of K4 (about 2 ms). The limiting factor in a real station setup will most likely be the keying characteristics of the excitation source (Ten-Tec Triton, Delta, Omni, and Corsair transceivers match the QSK speed of the Titan).

Two other small circuits are of interest. Fig. 3 shows the SWR circuitry. It is of straightforward design, but uses a relatively small number of parts to drive a wattmeter with 2.5 kw forward and 250 watt reverse power scales. Because of the 10:1 ratio of the power scales, a quick check that the SWR is at least below 1:2 is always possible, since for that condition the overall meter deflection in the reflected position must only be less than the deflection in the forward position (once the scales on the meter have been calibrated). The outputs **FWD MTR** and **REV MTR** shown in fig. 3 go directly to the meter's forward/reverse selector switch. The outputs are not used to trip the amplifier off in case of high SWR. The output shown as **PEAK M** in fig. 3 goes to the input shown as **FWD** in fig. 4. This input drives the LED peak power bargraph (D5 to D14) via the LM3914 bargraph driver IC. Again, the circuitry is basically simple but very effective. The bargraph display has nine green segments and one red segment. R1 is calibrated such that the *red* segment, D14, lights when the peak output power sensed is 1500 watts.

Although a panel meter reads the grid current directly, an LED indicator marked

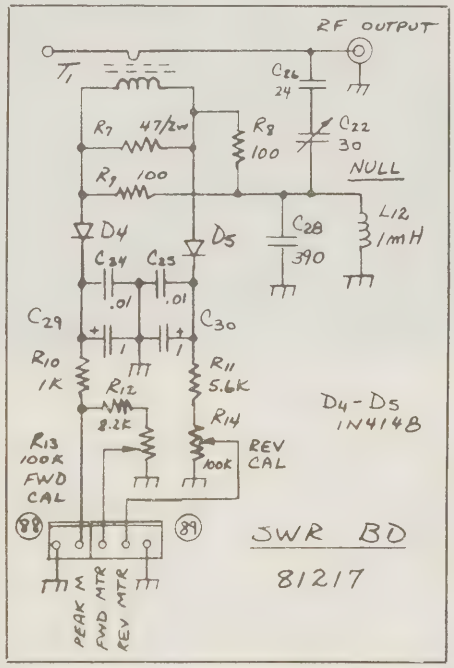


Fig. 3– The simple but effective SWR/power detection circuitry. T1 can be seen a bit next to a vacuum relay in one of the photographs. It's a simple toroid core transformer.

"overdrive" warns of excessive peak grid current. The circuitry is not shown, but basically it uses a comparator IC which senses the voltage across a 4.7 ohm resistor in the grid bias return line to ground. The comparator is biased to drive the LED when the grid current reaches 120 ma.

The diagram of the power supply is shown in fig. 5. The high voltage supply utilizes a Hipersil core transformer rated at 1.8 KVA CCS. The primary has two separate 120 volt windings but it is prewired only for the standard U.S. 117-neutral-117 system or overseas 230 volt operation.

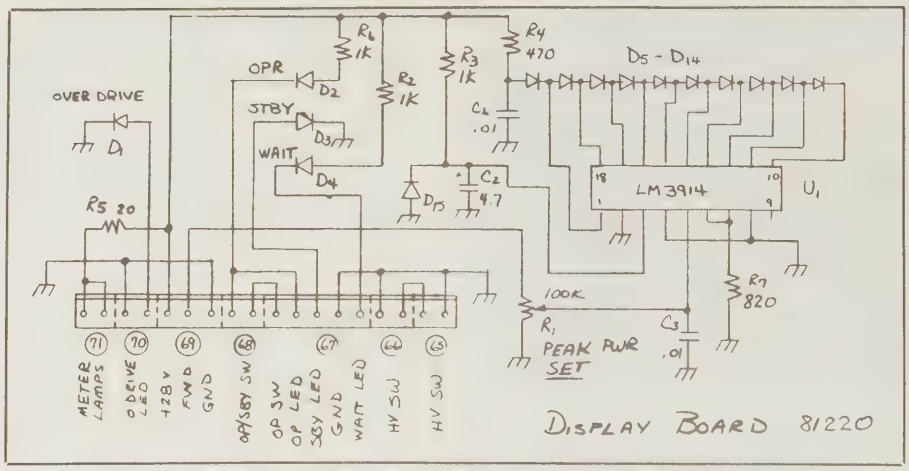


Fig. 4– The circuitry for the peak-reading power bargraph.

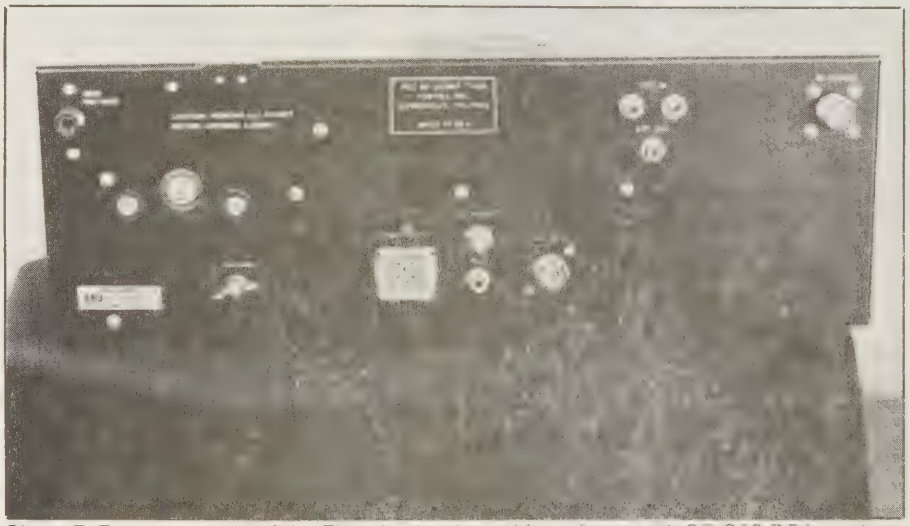


Photo 7. The rear panel of the Titan is simple and functional with SO-239 RF input/output connectors.

The high-voltage winding is connected to a full-wave bridge rectifier, not a voltage doubler, and the series bank of 400 mF capacitors provide for an effective 50 mF of output filtering. A low-voltage tap on the high-voltage winding is relay selected, and separate 20 volt and 13.5 volt windings provide power for the control circuitry and relays and the amplifier tube filaments. There is an interlock switch and crowbar shorting switch, as on the amplifier unit itself. The former acts to disable the turn-on of AC power to the supply when its cover is removed, while the latter just plain shorts the high voltage to ground both to discharge the capacitor bank and to act as a double protection in case the interlock circuitry fails. In case of a "crowbar" operation, D13 and R1 in fig. 1 limit the surge current so no power supply components are damaged.

Construction

The photographs tell most of the story about the construction of the Titan.

The power supply is housed in a separate enclosure and has no controls. The filter capacitor bank is associated with one main PC board, while the rectifier components are located on another PC board. The construction is very neat and standard, and heavy-duty components are used throughout.

Looking inside the amplifier compartment, one can see the general layout used with the tuning and loading capacitors towards the outside edges, the coils for the Pi-L output network in the center, and the two power tubes on a separate, raised chassis assembly. The latter is pressurized by a squirrel-cage fan which forces air into the side of the chassis enclosure and which exhausts upward through the tube anode fins. Insulated chimneys around the anode of each tube channel the air flow. The air intake is from the sides, not the bottom, of the amplifier enclosure. A small PC board located near the output coaxial connector contains the vacuum relay for antenna transfer. Looking at the bottom of the amplifier, with the cover plate of the tube compartment removed, one can see the tuned input circuitry. The back panel of the amplifier contains regular SO-239 connectors for RF in/out, phono-type connectors for key line functions, and a special high-voltage power-supply connector. The construction appears to be very sturdy, and there is a generous use of machine screws where some manufacturers might have used rivet fastenings, plenty of teflon insulation around coil tap wires, etc. The bandswitch is a heavy-duty, ceramic insulated type.

PTT and CW operation are about as simple as can be imagined and are shown in

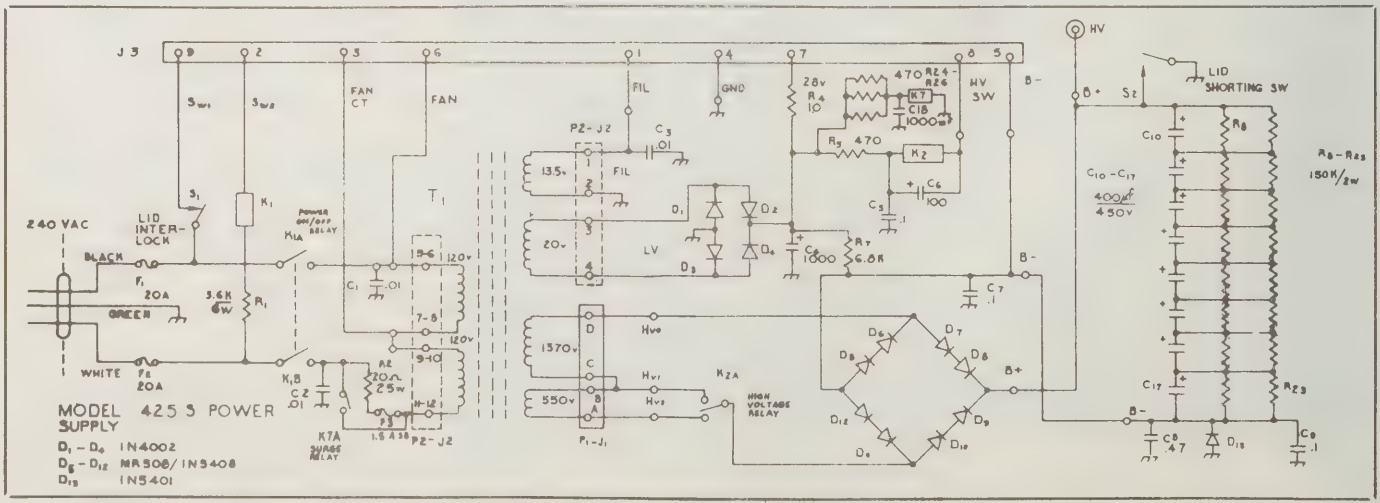


Fig. 5– The power supply. Only 240 VAC operation is recommended.

fig. 6. The dotted line showing ALC interconnections is **not** necessary in the case of solid state transceivers. The ALC interconnection may only be necessary with tube-type transceivers. In this case the Titan is designed to supply a negative-going control voltage to the ALC **input** on such a transceiver. For QSK operation, the interconnection scheme of fig. 7 is used. In this mode the amplifier itself, not the exciter, is actually keyed. The amplifier QSK system keys the exciter after ensuring that the amplifier's relays cannot be hot switched. The Titan manual supplies full information on the interconnections, but it is just interesting to note how simple it is to accomplish.

Tuning and Operation

Tuning of the Titan is greatly facilitated by the vernier drives employed on the loading and tuning controls and the combination of the analog meters and the LED bargraph power display. One doesn't go through the usual "tune for plate current dip and adjust the load control" routine. With the high-voltage switch in the low position, drive is applied, and the load and tune controls alternately adjusted so the power output peaks as viewed either on the analog meter (set to forward power) or on the LED display. After a bit of practice it becomes extremely easy to tune the amplifier just watching the LED display, because it is so responsive to changes in the control settings. In fact, I would rate the Titan as the easiest tube-type linear to tune of all the manually tunable linears available.

One can operate the amplifier in the low power mode (750 watts output) continuously (the maximum time tested was 30 minutes) for RTTY/SSTV or switch the high-voltage switch to high, repeak the controls, and operate any mode in intermittent service at 1500 watts peak output. The amplifier was operated many hours at a time in SSB and casual CW at its maximum rated power output level, and there never was any sign of overheating. The last, red-colored segment on the LED bargraph display lights when one just reaches 1.5 kw output and is a very handy indicator. The same is true of the handy red LED indicator for "overdrive." One doesn't always remember to check the grid current when making a quick QSY or band change, and the LED gives a very quick warning in case of overdrive. As Ten-Tec emphasizes, if any operating fault is likely to be responsible for destruction of the power tubes, it will be excessive grid dissipation, although avoidance is easy by proper drive and loading adjustments.

The power output versus drive requirement for the Titan was found to be remarkably uniform over the 160–15 meter bands with only 60–70 watts for drive required for 1.5 kw output. The input SWR never exceeded 1:1.6. The analog meter wattmeter checked to be very closely calibrated. The LED bargraph peak wattmeter was a bit generous around the 500 watt output level, indicating more like 600 watts, but then checked out fine again at the 1.0 and 1.5 kw levels. The IMD products measured about −37 dB from 1.0 kw peak at 14 MHz. The harmonic output was not completely measured, but the claimed value of −50 dB appeared to be, if anything, conservative. As is true with almost any tube-type linear, the Titan is reasonably tolerant of small load SWR variations. It would work perfectly into a slightly changing antenna load at full power (e.g., SWR changing from 1:1.0 to 1:1.7 or so) under conditions where a solid state, high-power linear would shut down. The forced-air cooling system is very good but not perfect. There is some slight mechanical vibration to be heard besides the sound of pure rushing air. But, I do admit to being somewhat of a nit-picker on that sort of thing. I really think the blower motor should be separated from the amplifier enclosure, but that would necessitate another unbilical cord coming out of the amplifier, which most amateurs would not accept. In any case, the blower noise from the Titan is not objectionable for any sort of normal station operation including the use of high audio gain speech processors on SSB.

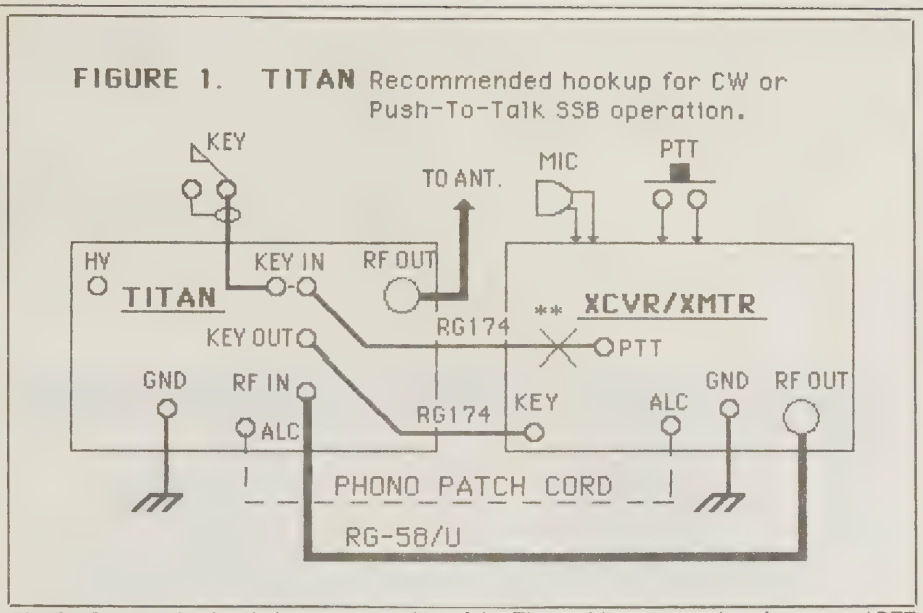


Fig. 6– Extremely simple interconnection of the Titan with a transceiver for normal PTT SSB/CW operation. The ALC connection is not required with solid state transceivers.

On-the-Air Results

When actually using an amplifier like the Titan, one does have to realize that one is dealing with **real** RF power. In the

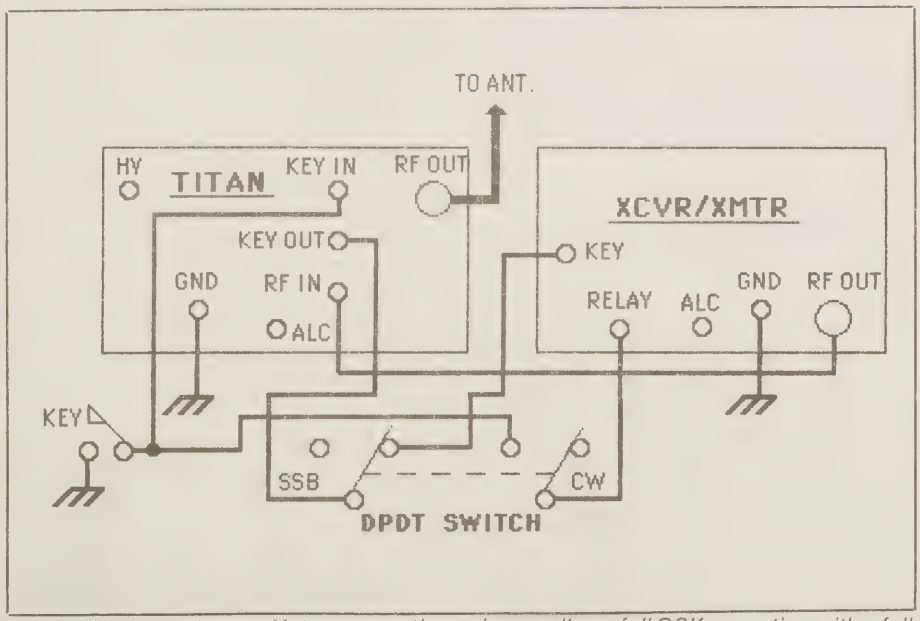


Fig. 7– A slightly changed interconnection scheme allows full QSK operation with a full QSK transceiver.

course of testing and using the Titan, the oil was heated and bubbled out of a dummy load rated at a nominal 1 kw, and a balun rated to handle 1 kw was ruined. Also, one end of a 40 meter dipole was allowed to come too close to a concrete roof surface and RF burned a hole into the concrete. So, one does have to have an antenna system that complements the power level of the Titan if one is going to operate the linear at full power! If one does have such a complementary system, the on-the-air results can be most gratifying. Compliments like a "beautifully clean" signal and signal reports of S9 + 20 dB or even S9 + 30 dB were not uncommon. Stations could be worked through pile-ups under conditions that otherwise would have been hopeless. Of course, brute RF power is one thing, but real RF power that also delivers a clean signal is something else again.

The Titan delivers both a powerful and clean on-the-air signal to judge by all the reports received, and the reports, of course, confirm the various measurements made on the Titan. The full QSK capability of the Titan was not tested. It was used up to about 20 wpm QSK, and stations reported clean keying while received CW was not truncated in any way. Considering Ten-Tec's devotion to producing properly performing full QSK equipment, there is no reason to believe that the Titan could not operate QSK up to 50 wpm as specified.

The Titan is the sort of amplifier that one gets used to using and tends to leave on even when full power is not required. The latter is, of course, quite poor amateur radio practice, but the almost inevitable result of using a linear which one feels confident will loaf along for hour after hour at its full rated power.

Manuals and Warranty

The manual supplied with the Titan is very complete. It contains a full description of how to interconnect the amplifier, how to tune and use the amplifier, detailed discussions of circuit theory (particularly pertaining to the metering and QSK circuits), and complete circuit diagrams. A chart gives approximate control settings for each band. A particularly detailed "Maintenance and Troubleshooting" section goes through some 21 detailed symptoms of malfunction and, if encountered, what to do about it. It's hard to imagine that any user would encounter a problem that is not covered. The Titan comes complete with all the necessary interconnecting cables appropriate to most transceivers and even, as a nice touch, extra fuses and a set of hex wrenches so one can retighten the front-panel control knobs (presumably after a few years of vigorous use).

Ten-Tec provides a basic one-year warranty for the Titan which includes workmanship and material except for the power tubes. The latter are warranted directly by Eimac/Varian for 3,000 hours of filament "on" time with a prorated adjustment, in case of failure, from 300 to 3,000 hours. Ten-Tec supplies Eimac warranty forms for the tubes and offers to assist in any claim. It should be noted that the 3,000 hour warranty means that even if the amplifier is used for several hours of operation each day, the tubes are covered for almost three years of operation.

Summary

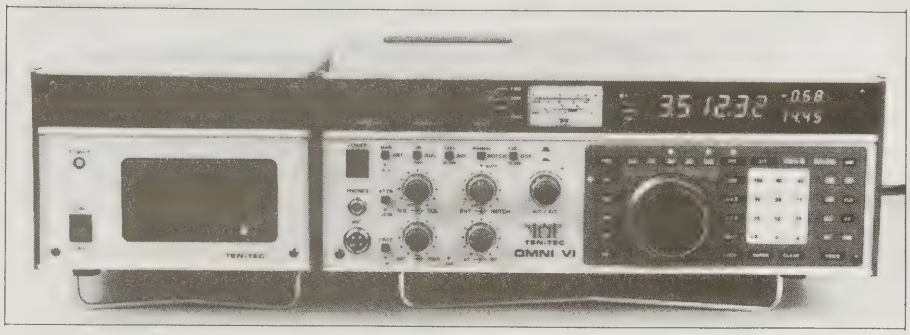
The Ten-Tec Titan is certainly not an inexpensive piece of equipment (amateur net $2685.00). However, it is good, honest value for the money if one really desires a full-featured, legal power amplifier of conservative design that should provide reliable service for a number of years with the guarantee that if something should go wrong, Ten-Tec is available to take care of the problem. The latter, by the way, is not just an empty suggestion. Ten-Tec's service and information people are readily available, very responsive, and quite knowledgeable. That has certainly been my personal experience over the past few years every time I have had contact with them. CQ

Product Review

Conducted By James W. Healy, NJ2L
Senior Assistant Technical Editor

Ten-Tec Omni VI MF/HF Transceiver

Reviewed by Rus Healy, NJ2L



When we reviewed Ten-Tec's Omni V in November 1990 *QST*, we wished for several changes and additions to that radio. We also speculated that an Omni V with those changes would make a dandy Omni VI. And so it does. Though still a ham-bands-only radio that looks a lot like the Omni V, the Omni VI is substantially different than its predecessor in many important respects. It has more high-performance features, makes good use of DSP technology, implements its basic functions better, and has fewer limitations.

Ten-Tec openly states that this radio is aimed at the most demanding Amateur adio users: DXers and contesters. During Omni VI development, Ten-Tec's engineering staff actively sought input and feedback on the design from contesters, DXers and software authors. They shipped prototype radios to people for evaluation, asked opinions at every stage, and arrived on the Omni VI that we review here. Has this strategy yielded a substantially better Ten-Tec radio for high-performance-minded hams? In a word, *yes*.

Standard Features and Options

On the spec sheet, the Omni VI looks very much like the Omni V. It has the same basic specifications—frequency coverage, receiver sensitivity and dynamic range, and so forth (see Table 1). Among its new features are:

- Digital signal processing and a menu system for user-programmable features.
- Band registers similar to those in other current radios. For each band, the rig has two tunable memories (VFOs); pushing any band key repeatedly toggles between the two. When you leave a band and later return to it, these registers default to the settings they last held. This is really handy (you can set up one register for CW and the other for SSB, for instance). And it's configurable: If you prefer, you can set it to keep the 100-kHz-and-down digits the same as you step through the bands (ie, from 14.025 to 21.025 to 28.025, etc).
- RIT and XIT. You can clear the RIT/XIT offset without centering a knob or any such nonsense.
- 100 memories that store frequency, mode, filter selections, RIT and XIT offset, and split status. (Band registers don't store split status.) Memories can be scrolled with or without hearing activity on the stored frequencies as you move through the channels, and are programmed and chosen by number. The Omni VI also has one "scratch pad" memory.
- The equivalent to a Kenwood **T-F SET** key: the **REV** button. It lets you easily listen to and tune the second (transmit) VFO frequency in split mode.
- A separate receive-antenna jack with a front-panel selector button and indicator.
- A built-in keyer with a speed range of 10-61 WPM and a front-panel speed control. Weighting is adjustable over a wide range via the keypad, as is the rig's sidetone volume.
- Variable-speed memory and band scanning.
- Cross-band, cross-mode capability.
- FSK mode with a fixed 170-Hz shift. Other shifts are available if you use AFSK.
- A large, clear LED frequency display. The main readout uses half-inch-high digits. The 10-Hz digit is green; the others are amber. Secondary displays, one above the other at the right-hand end of the main display, use 0.3-inch digits. The lower-right display normally functions as a clock, but also serves several other functions, such as memory-channel display.

Unlike any other radio on the market, the Omni VI has *two* serial ports. The DB25 RS-232-C port can be used for computer control, an external tuning knob or accessory control (remote antenna switching, etc). The 1/8-inch jack is directly compatible with ICOM's CI-V interface standard. Through both ports, the radio directly supports the ICOM command set (and has a few more of its own). The serial ports support data rates of 1200, 2400, 4800, 9600 and 19,200 kbits/sec. Software that supports current ICOM radios should work with the Omni VI.

A wide selection of optional filters, including one dedicated for FSK, a choice of four narrow CW filters and another two for SSB, speak to the rig's goal of serving high-performance-oriented operators. Other major options include a voice synthesizer and ALC annunciator (both are useful for vision-impaired operators). The review rig is fitted with a typical complement of contesting/DXing filters: 500-Hz CW units for the 6.3- and 9-MHz IFs, and a 1.8-kHz SSB filter for the 9-MHz IF.

The rig comes with all matching plugs, as do most current radios. This is especially welcome, because Ten-Tec uses different jacks than most manufacturers for the microphone, key and keyer (4 pin, phono, and 1/8-inch stereo, respectively). A microphone is optional.

The Omni VI lacks three features available in almost all of its competition: an automatic antenna tuner, general-coverage reception and an SSB transmitted-audio monitor.

The Bottom Line

Combining top-notch RF performance and a very reasonable price, the Omni VI is a true bargain among high-performance transceivers. It's equally at home in contesting, DXing and casual operation.

Digital Signal Processing, Software Control and Menu Selections

DSP

The Omni VI uses digital signal processing to great advantage. The two main features Ten-Tec has implemented this way are an automatic notch filter and a low-pass CW filter. The automatic notch filter is very effective—it *wipes out* carriers, heterodynes and birdies in the audio passband within a fraction of a second of detecting their presence. With two signals in the passband, the automatic notch filter reduces each one by *over 50 dB*—so much that there's *no* audible sign of a signal in

Table 1

Ten-Tec Omni VI MF/HF Transceiver, Serial no. 40A10622

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency coverage: 1.77-2.33, 3.47-4.03, 6.82-7.38, 9.97-10.53, 13.97-14.53, 17.97-18.53, 20.97-21.53, 24.47-25.03, and 27.97-30.03 MHz.	As specified.
Modes of operation: CW, FM, FSK, LSB, USB.	As specified.
Power requirement: 12-14 V dc at 2 A max on receive and 20 A on max on transmit.	At 13.8 V, receive, 1.77 A max; transmit, 14.4 A max.
Receiver	*Receiver Dynamic Testing*
Receiver sensitivity (10 dB [S+N/N], 2.4 kHz bandwidth SSB and CW): 0.15 μV (−123.5 dBm).	Minimum discernible signal (noise floor) with 500-Hz If filters: 1.8 MHz, −129 dBm; 3.5 MHz, −133.5 dBm; 14 MHz, −136 dBm; 28 MHz, −136 dBm.
FM (12 dB SINAD, 15 kHz bandwidth): 0.3 μV (−117 dBm).	29 MHz, 15-kHz filter: −115 dBm.
Blocking dynamic range: Not specified.	Blocking dynamic range with 500-Hz IF filters:* 1.8 MHz, 117 dB; 3.5 MHz, 123.5 dB;† 14 MHz, 128 dB;† 28 MHz, 127 dB.
Two-tone, third-order IMD dynamic range (20-kHz signal spacing, CW bandwidth): More than 100 dB.	Third-order IMD dynamic range with 500-Hz filters:* 1.8 MHz, 92 dB; 3.5 MHz, 95 dB; 14 MHz, 100 dB; 28 MHz, 96 dB.
Third-order input intercept:†† 10 dBm.	1.8 MHz, 9 dBm; 3.5 MHz, 9 dBm; 14 MHz, 14 dBm; 28 MHz, 8 dBm.
S-meter sensitivity (for S9 reading): 50 μV.	At 14 MHz: 100 μV.
FM squelch sensitivity: Less than 0.6 μV.	As specified.
Notch-filter attenuation: Not specified.	Manual notch, 40 dB; automatic notch, 50 dB with two in-band test signals.
Receiver audio output: 1.5 W into 4 Ω at 2% distortion.	1.9 W into 4 Ω at 2% total harmonic distortion.
Receiver IF/audio response: Not specified.	At −6 dB: SSB, 2.4-kHz IF filter, 520-2215 Hz (1695 Hz); SSB, 1.8-kHz IF filter, 684-2161 Hz (1477 Hz); CW, 500-Hz IF filters, 600-Hz offset), 398-806 Hz (408 Hz).
Transmitter	*Transmitter Dynamic Testing*
Transmitter power output: Adjustable from 0-100 W on CW, FM, FSK and SSB.	Adjustable from 0 to 108 W (CW, SSB, FM—output varies slightly from band to band).
Spurious-signal suppression: >45 dB.	As specified, except at 7 MHz (−41 dBc). Meets FCC specifications for equipment in this power-output class and frequency range.
Third-order intermodulation distortion products: With two tones, −30 dBc at 100 W output.	As specified. See Fig 1.
CW keying characteristics: Not specified.	See Fig 2.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	AGC fast: S1 signal, 24.5 ms; S9 signal, 24.5 ms.
Composite transmitted noise: Not specified.	See Fig 3.
Size (height, width, depth): 5.75 × 14.75 × 17 inches; weight, 16 pounds.	

*Blocking dynamic range and third-order IMD dynamic range measurements were made at the ARRL Lab standard signal spacing of 20 kHz.

†Noise limited.

††Third-order input intercept (dBm) = MDS (dBm) + 1.5 × third-order IMD dynamic range (dB).

the passband, unless you tune the receiver, in which case it takes the filter a few milliseconds to renotch the offending signal(s). The automatic notch filter takes out several signals at a time and is especially useful on 40-meter SSB here in the Northeast. You can even use it to get rid of a nearby carrier while receiving fairly fast CW, because the automatic notch filter gets rid of the carrier but isn't quite fast enough to take out the desired signal. As a bonus, the rig's second, manually operated notch filter can be used concurrently with the auto notch.

The DSP low-pass filter is equally useful. It has menu-selectable cutoff frequencies in 200-Hz steps from 600 through 1400 Hz. Set to 600 Hz, it works very well with the rig's optional CW IF filters.

Software Control

VOX adjustments, CW sidetone level, internal-keyer weighting, display-dimmer level and other infrequently-changed parameters are set via buttons along the right-hand side of the keypad. All of the rig's controls are on the front panel.

You can choose your frequency-selection priorities (ie, how the main keypad works). The default mode is the same as most other keypad-equipped rigs on the market: the main function of these buttons is band selection. Pressing **ENT**er first puts the keypad in direct-frequency-entry mode. You can easily change the default to whichever mode you prefer.

The Omni VI uses a menu system for many of its functions. Pressing **LOCK** for about 2 seconds brings up the menu. Multicharacter descriptors on the main frequency display tell you what you're changing, and the right-hand displays show you the current settings as you change them with the **RIT/XIT** knob and up/down arrow keys. Menu options include CW offset/sidetone frequency (400 to 990 Hz in 10-Hz steps—and yes, sidetone frequency tracks offset); computer-interface data rate and port address; and the DSP low-pass filter cutoff frequency.

On the Air

Logical layout of mode, filter and other commonly used keys around the adjustable-drag main tuning knob helps make the radio a pleasure to use. You can select any IF filter in any mode (except FM, in which the bandwidth is fixed at 15 kHz). The display dimmer changes the intensity of the main display, sub displays and meter. It doesn't regulate the LEDs in the mode and filter buttons, however.

You can choose fast, slow or disabled AGC. The Omni VI's AGC is simply ex-

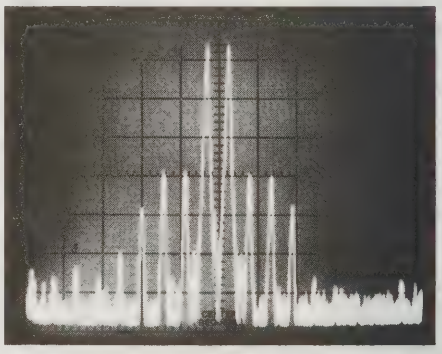


Fig 1—Worst-case spectral display of the Omni VI transmitter during two-tone intermodulation distortion (IMD) testing. Third-order and fifth-order products are approximately 39 dB below PEP output. Vertical divisions are 10 dB; horizontal divisions are 2 kHz. The transceiver was being operated at 100 W PEP output at 14.2 MHz.

cellent across the spectrum of signal strengths and modes—it's among the very best AGC systems I've ever heard. The rig's fast AGC doesn't decay quite as fast as some other radios, but it passes the acid test: It's pleasantly smooth even when used in receiving strong SSB signals.

The passband tuning (**PBT**) control, the radio's main interference-rejection tool, works like IF shift in other radios. It lets you move the passband around the center frequency to get rid of signals on either side, and to shape the receiver frequency response for the most pleasant sounding audio. Once you've selected the appropriate IF filters (and DSP LPF, if appropriate), **PBT** is *the* control you use to minimize QRM. This system is as simple as you'll find, and works well. There's just one, minor rub: Even though the radio's pitch-adjust mode links CW sidetone and offset, it doesn't automatically adjust the PBT to correspond to the new offset. To compensate, you simply move the **PBT** control slightly off center if you're using an offset other than 600 Hz.

The radio's receiver audio sounds good and is free of spurious noise (except at *very* high AF-gain settings, where digital noise is audible when you turn the main tuning knob or the **RIT/XIT** knob; this is no problem in operation).

Ten-Tec is perhaps best known for its excellent full-break-in (QSK) CW keying. The Omni VI carries on this tradition. The radio operates in QSK mode all the time—you choose whether you want the receiver to recover as fast as possible or after a semi-break-in-like delay. As you'd expect, the keyed elements are the same length and very well shaped—among the best you'll find in any radio—in both modes. In **FAST** QSK mode, received signals are audible between keyed elements at over 40 WPM.

Spotting (or *netting*, if you prefer) is done by pressing the **CW** mode button once you're in CW mode. Pressing this button superimposes the sidetone on the receiver audio, allowing you to match the desired signal to the sidetone.

In heavy-duty CW contest operation, the Omni VI really shines. Compared side-by-side to its high-end competitors, the Omni VI's AGC and selectivity at least equaled those of the other rigs, but the Omni's simplicity set it apart from its more-complicated counterparts.

No matter how easy a rig may be to use, a clean synthesizer chain is a key element in basic radio performance. Using a refined Omni V-like frequency-generation scheme (a VHF PLL that's divided down to the 5- to 5.5-MHz range and then mixed with crystal oscillators for each band), the Omni VI realizes *very* good, low-noise performance. The Omni VI's synthesizer is one of the very cleanest in any modern transceiver.

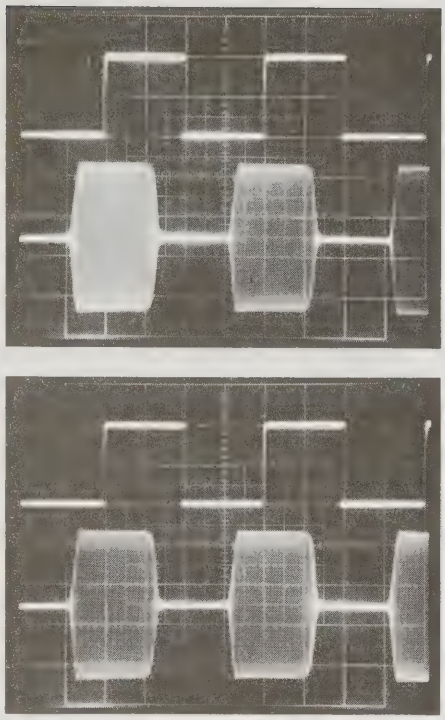


Fig 2—CW-keying waveforms for the Ten-Tec Omni VI in the slow-break-in mode (A) and the full-QSK mode (B). The upper traces are the actual key closures; the lower traces are the RF envelopes. Horizontal divisions are 10 ms. The transceiver was being operated at 100 W output at 14 MHz. Keying shaping is exceptional and relative character length is the same in fast and slow QSK modes.

Another basic performance issue is receiver IMD dynamic range. The Omni VI is *outstanding* in this area (see Table 1). It hovers near its third-order IMD dynamic range spec of 100+ dB with 20-kHz signal spacing and CW filters—first-rate performance. In fact, it's about the best you can buy. But when we first tested the review rig, it didn't meet this spec. In fact, it was off by almost 20 dB. Digging into the problem, Ten-Tec's engineering staff quickly found that the culprit was a single component—a coil, to be specific—that couldn't quite handle the RF current applied to it. Changing that part fixed the problem. And there was a bonus: The rig picked up about 3 dB of sensitivity. The numbers in Table 1 are those we measured after updating the review rig.

The change isn't difficult to make. Ten-Tec has notified Omni VI owners who've returned their warranty cards of the problem and their policy on the modification.[1]

The rig's IF filters perform well. Even with strong CW signals and low offsets (400 Hz), the filters attenuate the audio image well.

The rig has connectors for two keying sources—a paddle and an external key, keyer or computer—to separate jacks. This is very convenient.

At a fixed 5 kHz per knob revolution, tuning is sometimes a bit brisk in CW mode. Other software-selectable tuning rates, say, 2.5 or 1 kHz per division, would be a welcome addition.

The switched-capacitor manual notch filter has a range of 250 to 2200 Hz and is easy to adjust. It works well for notching single carriers, and is wide enough to provide some passband shaping. I found that wide-bandwidth receiver audio sounds best with the **NOTCH** knob fully clockwise.

On SSB, the Omni VI makes a good account of itself. As Fig 1 shows, the transmitter's third-order IMD products are down almost 40 dB, which is excellent for a rig with 13.8-V final-amplifier transistors. According to numerous reports, the speech processor helps signal intelligibility. Interaction between the speech **PROCESSOR** and **MIC**-gain controls makes the processor a bit touchy to adjust, however.

In SSB reception, the rig's strong receiver, outstanding AGC and the optional 1.8-kHz filter's good selectivity combine for rock-solid performance. Even on the low-frequency bands, where a wide range of signal strengths coexist with both man-made and natural interference, the Omni VI does an excellent job of letting you hear what you want to hear.

Smooth power-output adjustment, variable from zero to over 100 W, and keying provisions for both Ten-Tec's QSK amplifiers and non-QSK amplifiers, make for easy amplifier operation. The external-amplifier key line can be enabled or disabled from the menu. When enabled, this line's hang time is controlled by the VOX-delay setting.

The Omni VI has fewer receiver spurs than some earlier Ten-Tec radios. I counted 58 spurs, 18 of which are above S2. Of these, only eight are inside the ham bands. I also found seven spots (six inside the ham bands) where the synthesizer growls audibly as the tuning knob is turned. The Omni VI's high-performance competition still does better in this department, but except for one or two, I didn't even notice the spurs during operation. Most of them are *very* weak (within a few decibels of the receiver's noise floor).

The Omni V, when placed to the right of its matching power supply, suffered from loud 120-Hz hum coupled from the supply into the radio. This problem is absent in the Omni VI.

Of all the current radios I've used, the Omni VI is the easiest to interface to a computer. Simply plug one end of a serial cable

[1]If you have an affected radio, Ten-Tec will ship you a new circuit board and ask that you return the old one within 30 days, using the same packaging they used to ship you the new board.

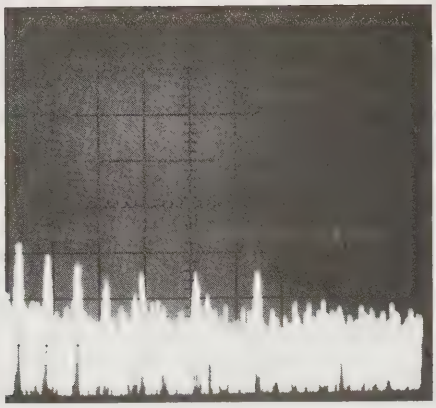


Fig 3—Spectral display of the Omni VI transmitter output during composite-noise testing. Power output is 100 W at 14 MHz. Vertical divisions are 10 dB; horizontal divisions are 2 kHz. The scale on the spectrum analyzer on which these photos were taken is calibrated so that the log reference level (the top horizontal line on the scale) represents −60 dBc/Hz and the baseline is −140 dBc/Hz. Composite-noise levels between −60 and −140 dBc/Hz may be read directly from the photographs. The carrier, off the left edge of the photographs, is not shown. These photographs show composite transmitted noise at frequencies 2 to 20 kHz offset from the carrier. Some low-level spurs are visible within 13 kHz of the carrier frequency, but the Omni VI's composite-noise characteristics are very good.

into the radio, and plug the other end into the computer. No expensive RS-232-C to TTL level converters, no extra power supply, no fuss. I had no problem controlling the radio with *CT* during contests.

The low-pass CW filter and automatic notch filter are implemented in the DSP unit, and only one can be enabled at a time. If you're using the low-pass filter and you poke the auto-notch button, the auto-notch comes on and disables the low-pass filter. To reenable the low-pass filter, you can simply cycle the rig into transmit and back to receive, or bring up the menu and immediately exit it. In practical terms, this isn't usually a problem because I seldom used the automatic notch filter in CW operation.

Because the Omni VI uses an ovenized reference oscillator for its PLL and band-specific crystal oscillators, the tuned frequency drifts rapidly when you first turn on the radio (as the oscillator oven warms up). Worst-case warmup drift in the review radio is about 300 Hz, mostly within the first 2 to 3 minutes. After that, drift is imperceptible. Of course, the frequency display doesn't change during this process, because it displays what it's told to by the radio's microprocessor.

Another related byproduct is frequency error that varies from band to band. On most bands this is very small (less than 50 Hz). The worst-case error we measured on any band (when the radio was fully warmed up) was about 80 Hz.

When we first tested the Omni VI, isolation between the auxiliary receive antenna and the main antenna was a barely adequate 30 dB. With a big 40, 80 or 160-meter antenna and a low-noise, low-gain directional receive antenna connected to the rig, selecting the receive antenna with the **AUX ANT** switch didn't provide quite the advantage it should have—too much signal from the main antenna leaked through the radio's diode switch, degrading receive-antenna quietness and directivity. Ten-Tec redesigned the switching circuit using PIN diodes,[2] considerably improving isolation.

Documentation

Ten-Tec shipped the Omni VI with a preliminary manual until late last fall. Early buyers who returned their warranty cards recently received complete manuals.

The manual contains a list of controls, front- and rear-panel connections, basic operating instructions and descriptions of the menu choices and what they do. It includes valuable tips on how the controls operate, saving you lots of time. Specifics of computer-control operation, rear-panel connector specifications and the full package of schematics and circuit descriptions Ten-Tec is known for are also included. The manual is first-rate.

Conclusions

To say that the Omni VI is a worthy successor to the Omni V is an understatement. Of all the truly high-performance radios currently on the market, the Omni VI is the easiest to use, and is one of very few radios that combine top-shelf basic radio performance with a reasonable price. Ten-Tec's approach to designing and testing this radio shows their commitment to demanding users.

Does the Omni VI hit its target of providing outstanding performance for contesters and DXers? In my opinion, yes. And it fits equally well into casual operators' stations. It's a radio of which Ten-Tec should be proud.

My thanks to Dave Newkirk, WJ1Z, and Dave Sumner, K1ZZ, for their contributions to this review.

Manufacturer's prices: Omni VI, $2285; 961 power supply/speaker, $225; 250- and 500-Hz CW filters and 1.8-kHz SSB filters, $69 each; 500-Hz FSK filter (9-MHz IF), $69; 700C hand microphone, $39.95; 705 desk microphone, $74.95; voice synthesizer, $59; ALC annunciator, $34. Warranty: 1 year. Manufacturer: Ten-Tec, 1185 Dolly Parton Pkwy, Sevierville, TN 37862, tel 800-833-7373 or 615-453-7172, fax 615-428-4483.

[2]Because accessing the board containing this circuit is quite involved, Ten-Tec prefers to make the modification at the factory. Contact their service department for details.

THE HERCULES II, solid state KW linear amplifier.

High-tech simplicity, Base or mobile

Here is a compact, lightweight amplifier that offers a combination of unique features that can only be achieved using modern solid state technology. Instant on, 12-14 Vdc operation, no-tune broadband final and compact size. Add to that lightning fast QSK cw, remote control, superb linearity and a low drive requirement. Outstanding!

The HERCULES II is attractively styled to match the CORSAIR II or PARAGON and will interface nicely with virtually all transceivers. The front panel includes an analog multi-meter for collector current, voltage, forward power and SWR. A 10 element LED bar-gragh display indicates peak output power. Band selection is made from the front panel switch or remotely controlled through a rear panel connector. A front panel speaker is built-in.

The Model 9420 115/220 Vac power supply is in a separate utility enclosure and connects to the RF deck using a 6 foot power cable. An additional 20 amps @ 13.8 Vdc is provided to power a 100 watt output exciter.

General coverage operation from 160 through 15 meters. (Through 10 meters after authorized modification.)

The HERCULES II is the ultimate in simplicity, ease of operation, versatility and reliability. And best of all, it is affordable! Another proud product from Ten-Tec.

SPECIFICATIONS

MODEL 420, RF DECK

Operating frequency range: General coverage 1.6 to 29.999.99 MHz. (after authorized mod.) Coverage is in seven bands which are front panel or rear panel remote selectable.

RF power: 1000 watts input, 500/600 watts output, depending on frequency and load impedance.

Drive power: 65 to 80 watts typical for 500 watts output.

Distortion: -35 dB from 500 watt output level.

Harmonics: -50 dB typical.

Input and output impedance: 50 Ohms unbalanced, < 2:1 SWR.

Cooling: Internal forced air, rear panel exhaust.

Metering: Switch selectable forward power, SWR, Icc (collector current) and Vcc (Voltage). Ten element LED bar graph displays peak output power.

Primary power: RF deck, 12 to 14 volts @ 100 amps, maximum.

TX/RX switching time: 10 ms or less.

Duty cycle: 100% typical Amateur service. 10 minutes maximum continuous key-down @ 500 watts output.

Final amplifier transistors: Eight MRF458, or equivalent.

ALC: Internal, 1.5 dB range.

Protective circuits: Over-voltage and over-current lockout. Front panel "OVER-DRIVE" light.

Front panel controls: Multi-meter control switch, power on-off switch and band select switch.

Rear panel connections: RF in, RF out, DC input, TX/RX control jacks and remote control socket.

Size: HWD 5.25" x 12" x 14.5" Weight: 15 lbs.

MODEL 9420, AC POWER SUPPLY

Primary power: 110/125 Vac @ 14A or 220/250 Vac @ 7A, 50/60 Hz.

DC power output: 13.5/14.5 Vdc @ 100 amps, continuous. (20 amps for exciter plus 4 X 20 amps for the amplifier)

Protection: Primary line fuses, over-voltage and over-current lockouts (from RF deck).

Size: HWD 12.5" x 12.5" x 9.25" Weight: 58 lbs

TEN-TEC INC

HIGHWAY 411 EAST SEVIERVILLE, TENNESSEE 37862 (615) 453-7172

LIST OF 544 BIRDIES FROM A TYPICAL PRODUCTION UNIT

	Freq.	Type	Equivalent Level
80M -	3.857	Pulsing	1.50 uV
	4.000	Tone	2.30 uV
40M -	7.200	Tone	.30 uV
20M -	14.000	Pulsing	.23 uV
	14.292	Pulsing	.20 uV
15M -	21.320	Tone	.10 uV (when nulled)
10M -	28.486	Tone	.05 uV
	28.836	Tone	.20 uV
	*28.978	Tone	20.00 uV
	29.235	Tone	.20 uV
	29.843	Tone	.05 uV
	29.985	Tone	.25 uV
	30.000	Tone	.05 uV

ALL TRANSCEIVERS AND RECEIVERS that have mixers, i.e., the superheterodyne, will have birdies to some extent.

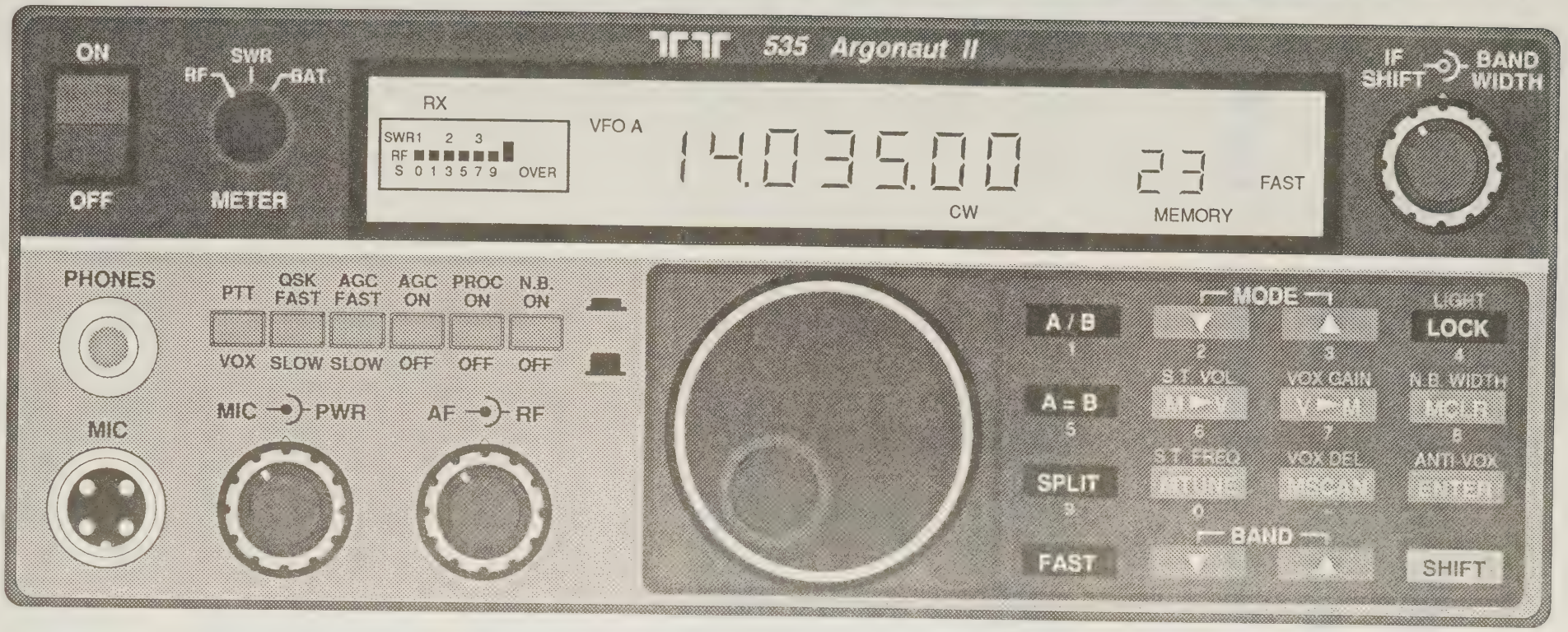
The birdies in the 544 are extremely low and with a given amount of signal coming in, the AGC will reduce the sensitivity of the unit to a point where birdies are negligible.

*Note: To operate near this frequency, switch to 29.0-29.5 band and tune to below lower band edge. The birdie will not be heard at this point.

TEN-TEC, Inc.

Dale Richman - W4NHM
Customer Service

THE ARGONAUT II, QRP AT IT'S FINEST . . .



SHOWN ACTUAL SIZE

The all new Argonaut II is the latest in a long, proud line of QRP rigs from Ten-Tec. This is a completely synthesized, PLL design which includes a general coverage receiver from 100 kHz to 29.999 MHz. The transmitter operates all ham bands, from 160 through 10 meters, SSB, CW and optional FM.

The maximum power output is 5 watts and is adjustable down to a few milli-watts. The rig is designed for energy efficiency for practical battery operation and features a large, multi-function, LCD display with selectable back lighting. Dual VFOs, non-volatile RAM memories and all of the other neat features you have come to expect in a computer based design.

A new Ten-Tec crystal filter (patent applied for) features continuously variable band-width from 500 Hz to 2.5 kHz. This allows the I-F band-width to be set exactly for the mode in use and the band conditions. This, in combination with the I-F shift adjustment, delivers outstanding receiver performance.

Another innovation, seen for the first time on the Argonaut II, is our "soft control" system (patent applied for) that allows front panel adjustment of VOX and sidetone controls. This is accomplished using shifted functions of the existing control buttons so no clutter is added.

We designed the Argonaut II for the QRP purist. When you say "rig is Argo 2" you are QRP without question.

COMPLETE SPECIFICATIONS WILL BE PUBLISHED JUNE 1989. TARGET PRICE $900. AVAILABLE OCTOBER TIME FRAME.

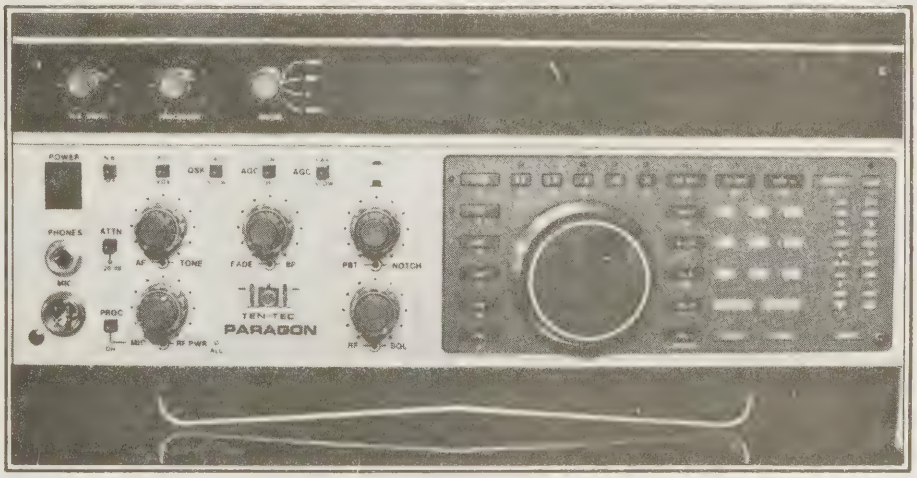
CQ REVIEWS:

Ten-Tec's PARAGON HF Transceiver

Part I – Overview and Technical Details

BY JOHN J. SCHULTZ*, W4FA/SV0DX

The PARAGON can be said to be the first microprocessor based, American-made transceiver which competes directly in its price class with imported transceivers. It comes from a manufacturer who has had a solid, long-term track record in the manufacture of amateur radio transceivers and an outstanding reputation regarding after-sales service. So, many amateurs might indeed have a special interest in taking a detailed look at the PARAGON. So, I have tried in this review article to take an in-depth look at the PARAGON starting with an overview of its features and circuitry and then going on to describe some of its special operating features and, finally, my own experiences after using the transceiver over an extended period of time.



Like they say in the advertisement, this is face to face with the PARAGON.

General

The PARAGON is a 100 watt output class transceiver that covers all of the HF bands and includes general coverage receive from 100 kHz to 30 MHz. It features direct keyboard frequency entry and bandswitching, dual digital VFO's, 62 memories (each of which stores frequency, mode, VFO A/B information, IF filter selection and a seven digit letter/number memo tag), memory scan (with channel lockout) and tuning of each memory channel via the main tuning knob or in an automated mode. Standard modes include CW (with full or semi break-in), SSB (with speech processor) and RTTY (true FSK or AFSK). FM is available as an option. Standard filters include a 6.0 kHz one for AM receive and a 2.4 kHz one for SSB/CW. Optional filters are available for 1.8 kHz and 500 and 250 Hz. There is a full range of both IF and AF selectivity controls (e.g. passband tuning, bandpass tuning, notch filter tuning, etc.).

An optional interface unit provides bi-directional communication between the logic circuits of the PARAGON and an external computer with RS232 capability. All of the keypad functions on the transceiver and the main tuning circuitry can be computer controlled.

The PARAGON is, of course, a completely solidstate design with no tuning controls except for the main tuning knob. The transceiver (with internal speaker) is contained in one enclosure while the power supply is external. Ten-Tec power supply and microphone accessories are available which allow the PARAGON to be immediately placed into operation as a complete station. The accessory items will be described in the final part of this article.

Please Take a Look

At the specifications for the PARAGON as shown in Table 1. It's a big table (because Ten-Tec provides so much detailed information) and, I realize, it can be boring reading to some. But, nonetheless, it provides a *wealth* of information. I should say factual information! The specifications are totally short on meaningless superlatives and concentrate strictly on facts and figures.

I won't go through the entire table but allow me to highlight various points:

Frequency Coverage: 100 kHz to 30 MHz on general receive. All bands, 160 through 10 meters, on transmit with modification possible for non-amateur band transmit.

Frequency Stability: an excellent 1 part per million per degree C even at 30 MHz.

Physical: A very light package (16 lbs) due to almost total aluminum construction. The dimensions would allow mobile or portable usage but augur best for home station usage.

RF Output Power: Adjustable up to 100 watts, key-down, in all modes. The power amplifier has no cooling fan and can operate key-down for 20-30 minutes.

Receive/Transmit Switching: Regular PTT or VOX. Fast or slow break-in on CW.

Transmit Spurious Suppression: Excellent at –60 dB for carrier and unwanted sideband suppression and quite reasonable

*c/o CQ Magazine

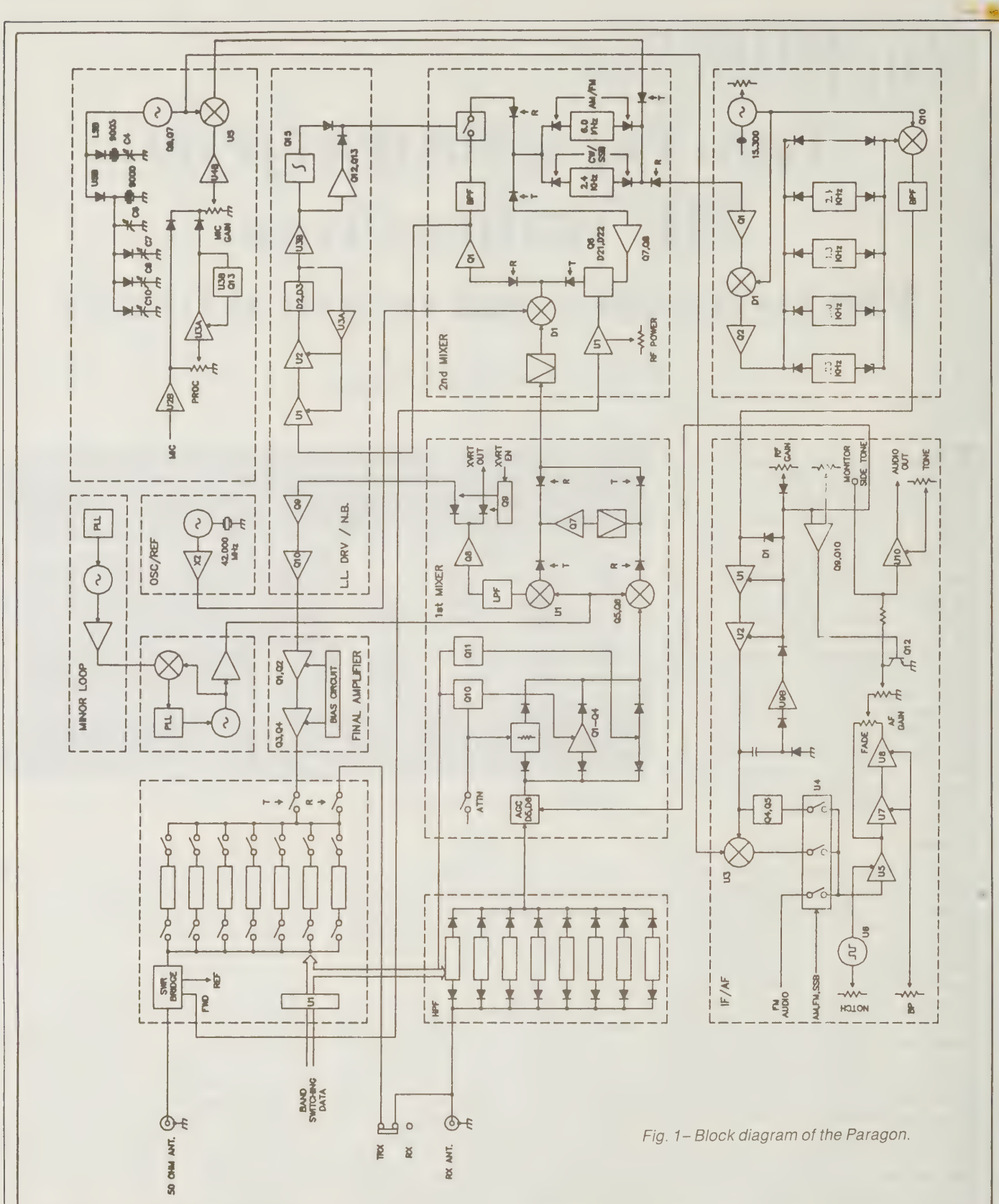


Fig. 1– Block diagram of the Paragon.

at – dB for miscellaneous spurious outputs.

Metering: Very complete including direct reading SWR, forward output power and audio processing level. A separate LED indicates ALC peaks.

Receive Sensitivity: Certainly state-of-the-art with 0.15 uV sensitivity in the HF range for CW and SSB modes.

Receiver Selectivity: Again, state-of-the-art with some outstanding skirt selectivity specifications, especially for the optional 1.8 kHz SSB filter, as will be discussed later.

Image and IF Interference Rejection: Outstanding at greater than – 70 to – 80 dB. These values appear to be due to careful "front-end" filtering plus the use of a 75

General

FREQUENCY RANGE	Receive: 100 kHz to 29.9999 MHz Transmit: Standard Ham Bands 160M—10M (Note: For operation outside Ham Bands contact factory.)
FREQUENCY CONTROL	Microprocessor controlled digital PLL synthesizer. 10 Hz resolution.
FREQUENCY READOUT	7 digit 10 Hz fluorescent readout.
FREQUENCY STABILITY	Worst case, 1 PPM per degree C. at 29.999 MHz.
ANTENNA IMPEDANCE	50Ω unbalanced.
POWER REQUIRED	Receive = aprox. 1.5A. Transmit = approx. 20 A. @ 13.8 VDC.
CONSTRUCTION	Rigid aluminum chassis. Extruded aluminum front panel. Textured top and bottom, snap up stainless steel bail.
DIMENSIONS	HWD 5¾" × 14¾" × 17"—14.6*37.4*43.2 cm.
NET WEIGHT	16 lbs.—7.25 kg.

Transmitter

MODES	USB, LSB, CW, RTTY (FSK or AFSK), (FM optional).
DC POWER INPUT	Maximum 200 watts @ 14 VDC CW, SSB, (FM). 100% duty cycle for up to 20 minutes. Continuous with auxiliary air cooling.
RF POWER OUTPUT	25 to 100 watts adjustable with front panel RF PWR control.
MICROPHONE INPUT	High/Low impedance. Four pin, front panel connector accepts microphones with 5mV (−62 dB) output. Polarizing voltage is provided for electrets.
T/R SWITCHING	VOX or PTT on SSB. Switchable FAST or SLOW QSK on CW.
CW SIDETONE	Internally generated, adjustable tone and volume independent of AF GAIN control.
SSB GENERATION	9 MHz, 8-pole crystal ladder filter. Balanced modulator.
CARRIER SUPPRESSION	60 dB typical.
UNWANTED SIDEBAND SUPPRESSION	60 dB typical at 1.5 kHz tone.
SPURIOUS OUTPUT	More than 45 dB below peak power output.
METER	Switchable forward power, SWR, collector current, audio processinglevel.
CW OFFSET	750 Hz automatic.
FSK SHIFT	170 Hz.
ATTENUATOR	Approx. −20 dB for 1.6 to 29.999 MHz, −10 dB for .1 to 1.6 MHz.
I-F FREQUENCIES	1st = 75 MHz, 2nd = 9.0 MHz, 3rd = 6.3 MHz (FM 3rd = 455 kHz).
RX ANTENNA INPUT	Switchable 50Ω phono jack.
IMAGE REJECTION	80 dB.
I-F REJECTION	70 dB.
NOISE BLANKER	Switchable on/off with adjustable width.
S-METER	Automatically switched on during receive. Calibrated to 50 μV at S9.
DYNAMIC RANGE	100 dB typical.
3rd ORDER ICP	+18 dBm
SQUELCH SENSITIVITY	AM, CW, SSB, FSK (1.6-29.999 MHz) = Less than 1 μV. Optional FM (1.6-29.999 MHz) = Less than .4 μV.
PASS BAND TUNING	±1.2 kHz.
AUDIO OUTPUT	1.5 watts @ 8Ω with less than 2% distortion.
NOTCH FILTER	250 to 2.2 kHz, 50 dB notch typical.
AUDIO BANDPASS FILTER	4 pole, variable center frequency 220 to 1.7 kHz, 35% bandwidth @ −6 dB. Variable fader control selects filtered or flat audio response.
TONE CONTROL	Variable 15 dB rolloff @ 5 kHz.

Receiver

MODES USB, LSB, CW, FSK/AFSK, AM, (FM optional).

SENSITIVITY	FREQUENCY MHz	.1 - 1.6	1.6 - 29.999	
	MODE			
	SSB, CW, RTTY	.5 μV	.15 μV	10 dB S/N @ 2.4 kHz
	AM	3.5 μV	1.0 μV	10 dB S/N @ 6.0 kHz
	(FM)	1.0 μV	.30 μV	12 dB SINAD @ 15 kHz

SELECTIVITY	SELECTIVITY FILTER	−6 dB	−60 dB
	STANDARD	2.4 kHz	3.36 kHz
	AM	6.00 kHz	11.25 kHz
	OPTIONAL	1.80 kHz	2.90 kHz
	OPTIONAL	.50 kHz	1.40 kHz
	OPTIONAL	.25 kHz	.85 kHz
	(FM)	15 kHz	30 kHz

Table 1

Power Output Versus Frequency

Frequency (MHz)	Adjustable Power Output (Watts)
1.80 - 2.01	18 - 100
3.50 - 4.01	18 - 100
7.00 - 7.31	18 - 95
10.10 - 10.16	18 - 95
14.00 - 14.36	17 - 100
18.06 - 18.18	17 - 95
21.00 - 21.46	18 - 95
24.80 - 25.10	18 - 105
28.00 - 29.71	18 - 100

Table 2

MHz first IF frequency.

Noise Blanker: A true I.F. type with adjustable width control.

Dynamic Range and 3rd Order Intercept Point: very excelent values especially considering that they are quoted with the receive preamplifer in use. Details will be discussed later.

Pass Band Tuning: True I.F. control which functions as a variable bandwidth control (±1.2 kHz) with the standard 2.4 kHz or optional 1.8 kHz IF filters and as an IF shift control with other IF filters.

Audio Bandpass Filter: As its name states, an audio filter. One can set the center frequency anywhere from 220 to 1700 Hz and then independently adjust the bandwidth, pulling it in or spreading it out from the center frequency selected. An interesting feature which combined with the audio notch filter equates to having a rather complete built-in accessory audio filter which is active in any receive mode.

Again, I would suggest that one muse a bit over Table 1 if one seriously considers investing in a Paragon. The specifications are detailed enough to be quite meaningful and, as bench checks proved, quite accurate.

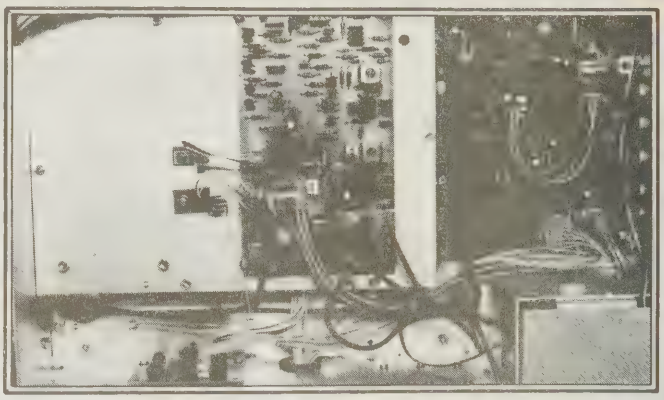
Circuitry

Fig. 1 presents a block circuit diagram of the PARAGON. Depending upon what one considers a true signal path IF signal conversion, one can consider the Paragon to be a triple or quadruple conversion design. The point is not really very important; the 75 MHz first IF feature is the key design feature of the transceiver which allows for general coverage receive and general coverage HF transmit.

Looking at fig. 1, one can generally trace the receive signal flow from the 1st Mixer block to the 2nd Mixer block to the filter block (lower right hand corner) and then over to the IF/AF block where detection, AF filtering and audio amplification takes place. The transmit signal flow path starts in the upper right hand block where a DSB signal is produced and then goes to the 2nd Mixer board to produce a filtered SSB signal and then on to the 1st Mixer board where the signal is translated to the output frequency. The signal is then amplifier in part of the Low Level Driver (L.L. DRV) board and Final Amplifier block to the 100 watt level. The 8 high-pass filters associated with the receive input are diode switched and the 7 low-pass filters associated with the transmit output are realy switched.

Overall, the basic signal flow paths in the PARAGON are the same as one finds in any general coverage transceiver. Transceivers do differ, however, in the ways that design engineers divide up the necessary signal processing and generation functions among various PC boards. Large PC boards mean more economical production but the danger of signal "glitches" and undesired interractions. Multiple, smaller PC boards mean a lot of costly interconnections. Ten-Tec has tak-

With the bottom cover removed, this is the lower half of the inside. The large board is the logic board. The two unused connectors on it are for the voice readout and RS232 interface options. The RAM/ROM board is plugged in just to the left of the unused connectors. It contains a socketed EPROM which can be exchanged if the software for the transceiver is ever revised.



This is the upper half of the inside. The boards shown are the low level driver, TX audio and sidetone. There are still other boards concerned with the oscillator circuits in the shielded compartment underneath the middle, low level driver, board.

en its own approach but, as one can note from fig. 1, they have been careful to separate various of the PLL and oscillator boards.

Construction

The PARAGON features almost total aluminum frame construction with an extruded aluminum front panel, multiple aluminum internal chassis sections and textured covered aluminum top and bottom covers. The construction is lightweight (16 lbs. or 7¼ kg) but yet very rugged. It should be almost totally immune to environmental factors no matter where in the world it might be used.

The photographs I made try to illustrate some of the constructional features but, in reality, they do a better mediocre job. There are a total of 14 glass-epoxy, double-sided PC boards and 9 glass-epoxy, single-sided PC boards. All of them use connectors and any one can be removed without soldering. The front panel is hinged to provide access both to its hardware and to the chassis sections behind it.

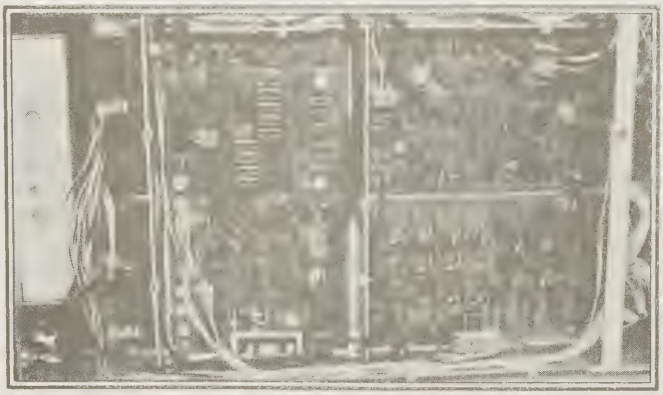
Taking off the top cover (see photograph) and looking inside the unit, one is immediately impressed by the quality of the construction and the spacious layout. Apparently a lot of thought was given to making the unit service-friendly such that one doesn't need a super detailed "roadmap" to find components and, if necessary, to remove or test them.

With the top cover removed one can see the large logic board, the low-level amplifier board, the TX audio board and the sidetone board. The shielded compartment to the rear enclosed the power amplifier. Removing the bottom cover, one sees the mixer boards, filter boards and the IF/AF board. The components associated with the PLL's and frequency synthesis are in separately shielded areas. The cable dressing is extremely neatly done. Overall, I would rate the construction "top quality."

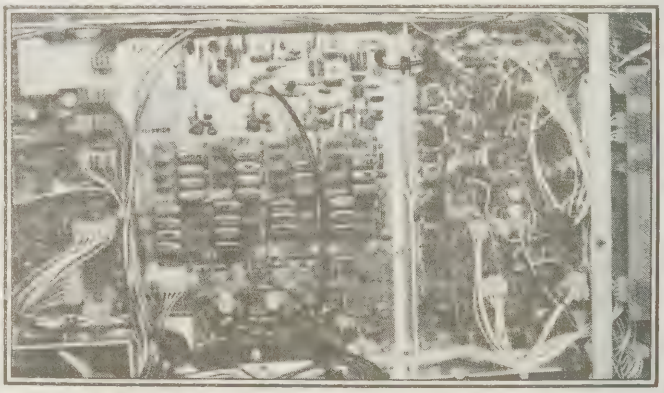
Checking It Out

Jumping ahead a bit let me say that the transceiver is easy to operate but to technically check the functioning of some 12 analog controls and some 52 switches or pushbutton controls took a bit of time. But, it was done and every control and indicator performed perfectly.

On the *transmit* side, Table 2 presents the power output measurements. Third order intermodulation products (two-tone test) were – 33 dB down (– 39 dB for fifth order). Carrier suppression and unwanted sideband suppression were outstanding at slightly less than – 60 dB. A look at a spectrum analyzer revealed no spurious or harmonic emission greater than – 50 dB. Use of the speech processor on SSB about doubled the average power output level. At 90-100 watts power out-



With the bottom cover and an internal overall bottom shield removed, this is the lower half of the inside. The 2nd mixer board in the middle contains the 8 pole 2.4 kHz SSB filter and 6 pole 6.0 kHz AM filter. The power amplifier is to the left in another separately shielded enclosure.



This is the upper half of the bottom inside. The large board in the middle is the passband tuning one. It contains the standard 2.4 kHz filter (left side) which in conjunction with the SSB filter on the 2nd mixer board, provides 16 poles of SSB filtering. The other filters to the right of the SSB one (all plug-in) are the optional 8 pole 1.8 kHz filter, the optional 6 pole 500 Hz filter and the optional 6 pole 250 Hz filter.

Filter Specification

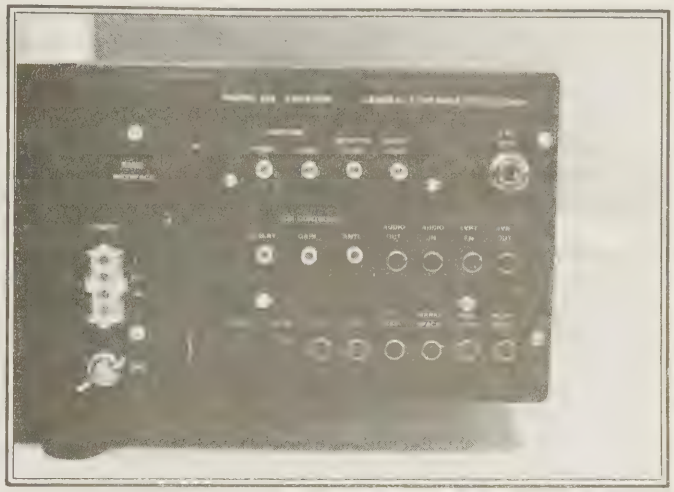
Filter	−6 dB Bandwidth	−60 dB Bandwidth	Shape Factor
AM	6.0 kHz	11.25 kHz	1.88:1
SSB	2.4 kHz	3.36 kHz	1.87:1
SSB (Optional)	1.8 kHz	2.90 kHz	1.80:1
CW (Optional)	500 Hz	1.4 kHz	2.80:1
CW (Optional)	250 Hz	850 Hz	3.40:1
FM	15.0 kHz	30.0 kHz	2.00:1

Table 3

S Meter Response

Standard	Filter Used	20 Meter	10 Meter
S9,50 uV	250 Hz	S8½	S8
	500	9	8½
	1800	9 + 3dB	9
	2400	9 + 2dB	9
	6000	9	8½
S5,3 uV	250 Hz	S5½	4¾
	500	5¾	5
	1800	6	5
	2400	6	5½
	6000	6	5¼
S3,0.8 uV	250 Hz	S3½	S2¾
	500	3½	3
	1800	4	3½
	2400	4	3½
	6000	4	3¼

Table 4



The right side of the rear pane. A very clean and logical layout of various connectors and seldomly used controls.

The left side of the rear panel. It contains mainly the large heat-sink for the power amplifier. There is no fan. None is necessary for normal usage of the PARAGON.

put from a cold start the transceiver was run 20 minutes key-down before I felt the heat sink for the output transistors was getting too warm to tolerate. But this is within the rating specified and one must remember that the transceiver has no internal cooling fan. For normal operation this poses no problem whatsoever but for extended contest or key-down mode operation, an external fan would give one more piece of mind and prevent the transceiver from tripping off during the middle of a QSO as its protective circuitry was activated. Overall, on the transmit side, the transceiver produces a very stable and clean output signal.

On the receive side, the PARAGON has features galore. The actual operating features which will be described in more detail later, nicely complement the excellent technical performance. No matter how you like to look at the "numbers," the transceiver has a low-noise design with an excellent "front-end." I measured the noise floor at −138 dBm (2.4 kHz bandwidth) and the Third Order Intercept plotted to +18 dBm with the RF preamplifier in use and +35 dBm with the input attenuator activated. Table 1 presented the claimed sensitivity measurements and they all checked as good or better than specified (except FM since the FM option was not available). The same is true for the filter selectivity measurements as shown in Table 3. Although the standard 2.4 kHz SSB filter has a good shape factor, that of the 1.8 kHz is really interesting and recommended for DX ers. The ultimate rejection of the filters is between 90-100 dB! Image and IF rejection were as good as claimed. The S meter calibration was "right on" with S9 being 50 uV and S3 about 0.8 uV. In fact, the S meter response was so good I decided to detail it a bit as shown in Table 4. It's rare to find a transceiver that isn't 3-4 S units out of calibration, especially on 10 meters. The calibration I show in Table 4 for S3, S5 and S9 refers to a Recommendation developed at the 1981 IARU Region 1 Conference. The squelch operates on all modes. The pass band tuning, notch filter and tunable audio bandpass filter form an interesting trio to combat QRM and although the numbers shown in Table 1 are correct, the usage of these controls can only be appreciated in practice. Receive recovery time was a hair under 30 ms making the transceiver usable in this respect for AMTOR operation. Keying rise and fall times were under 5 ms. The keyed signal exhibits the usual Ten-Tec quality. There is an internal CW waveshape control in case one has some special reason to change the keying response. Overall, receive specification are totally state-of-the-art and impressive even forgetting for the moment all of the unique operating features which translate the technical excellence into a user-friendly transceiver.

Interface Connections

The microphone input of the PARAGON will accept high (22K ohms) or low impedance microphones, non-amplified or amplified types, with a minimum out-

put of [illegible] crystal microphones with typical impedances of 100K ohms might be a problem. A standard 4 pin microphone socket is used; one of the pins provides a polarizing voltage in case an electret microphone is used.

The rear panel connections and functions are very extensive, as shown by one of the photographs. Just about every possible external interconnection possibility has been provided although no complex or unusual connectors are used. Generally, complete connections are provided for use with a linear amplifier, VHF transverters, a phone-patch, PTT foot switch, AFSK/FSK modems and a separate receive antenna. An auxiliary 12 VDC connector is provided for accessory items.

The VOX controls (delay, gain and anti-VOX) are all located on the rear panel as well as the controls for sidetone level and pitch, transmit audio monitor level and beep/voice level. The latter control refers to setting the level of an input confirmation beep for front panel keypad entries or to the output level of an optional voice synthesized frequency announcing IC. The concentrated, but not crowded, grouping of these controls on the rear panel of the transceiver is a very practical idea. They are normally controls that one would adjust only infrequently but, certainly, having them concentrated in one area is superior to having them spread out on the side, back or bottom panels of a transceiver and/or having them being recessed controls which require a screwdriver for adjustment.

Computer control (RS 232 Interface) interface information was not available at the time that this review was written. The optional Model 258 Interface Option Package is supposed to include a plug-in PC board that contains all of the necessary driver and interface circuitry, an RS 232 connector, connecting cable and complete command code information. All keypad functions and the main tuning circuitry can be controlled, according to Ten-Tec.

(To Be Continued)

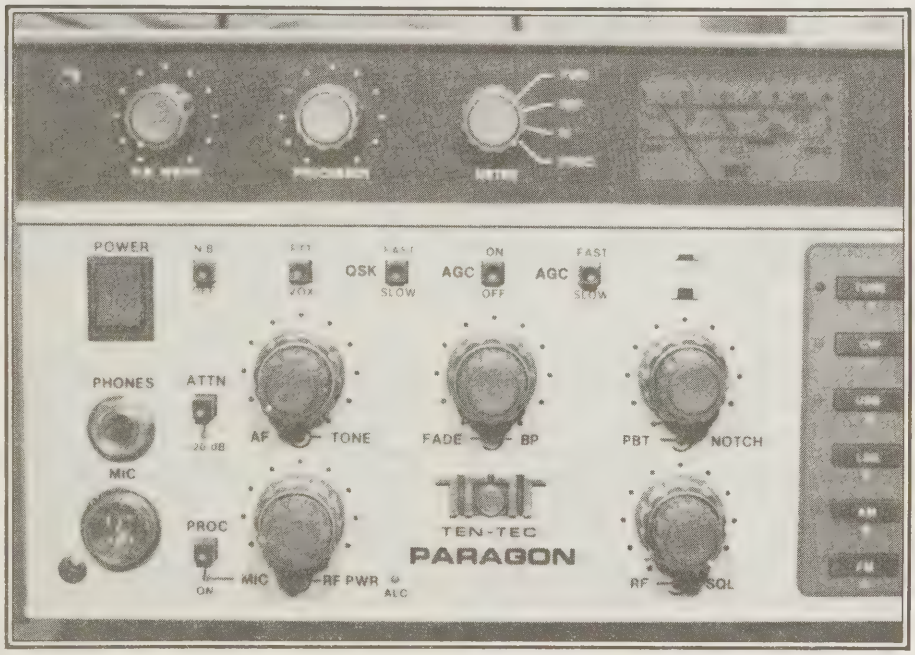
CQ REVIEWS:

Ten-Tec's Paragon HF Transceiver

Part II — Operating Features

BY JOHN J. SCHULTZ*, W4FA/SVØDX

The Paragon's front panel measures about 5¾" × 14¾". All of the controls, indicators, and switches are widely spaced, and you need not worry that if you adjust one control another nearby control might inadvertently be moved. All controls including the main tuning knob have a very smooth feel to them. In spite of the fact that the front panel of the Paragon contains enough knobs, switches, and LED indicators to rival an airliner cockpit, everything is very simply and logically arranged. The transceiver, in fact, is very simple to operate and enjoy once you just take the time to appreciate the basic grouping and functioning of the controls. The grouping of the controls and indicators can basically be divided into the mostly analog ones (to the left of the main tuning knob), the analog meter and digital displays above the main tuning knob, and the large array of pushbutton switches and LED indicators on a raised panel around the main tuning knob.



The left or "analog" side of the front panel on the Paragon.

Left Side Panel

The controls located here are those which, more or less, are found on most transceivers. They include controls for noise blanker width, speech processing level, AF gain/tone, AF selectivity tuning, passband tuning, notch tuning, microphone gain, RF power level, RF gain, and squelch level. There are switches for the meter function, noise blanker on/off, PTT or VOX selection, QSK fast/slow, AGC fast/slow, attenuator in/out, and speech processor on/off. There are LED indicators associated with the latter two switches, plus a separate LED indicator for ALC level. Finally, there are the microphone and headphone connectors plus an on/off switch for an external power supply. A photograph shows the layout of the left side panel.

The functioning of most of these controls is fairly obvious, although it might be worthwhile to highlight a few features. The meter selection switch allows monitoring via the analog meter of forward power (peak reading when SSB is used), reflected power, final amplifier collector current, and speech processing level. All this is very logical, but note that there is no ALC scale on the meter. ALC peak indication is provided by an LED located to the right of the microphone Gain/RF power output level control. It's a far better idea than having an ALC scale on the meter, since there hardly would be any point to having the ALC set to less than its effective operating point. Also, the arrangement allows you to check the ALC level and processor level *simultaneously* when speech processing is being used—a very convenient feature.

The attenuator switch effectively bypasses the receive RF preamplifier. The LED indicator below the switch provides a very clear indication that the "attenuator" has been activated.

The control marked **FADE/BP** will be a new one to most transceiver users. The controls are for a built-in tunable audio filter. The **BP** control (bandpass) controls the center frequency of the filter which is continuously tunable over 220 to 1700 Hz. The concentrically located **FADE** control is really more of a bandwidth control. For any given frequency setting of the BP control, the FADE control pulls in the AF filter skirts from a flat response to a moderately sharp one. Both controls are effective in any mode of reception. They can almost eliminate the need for an optional CW IF filter for the *casual* CW operator and enhance SSB reception under QRM conditions. The use of the controls is also quite useful for general shortwave broadcast station reception when trying to eliminate various forms of QRM.

The PBT (Pass Band Tuning)/Notch control is the main selectivity feature of the Paragon. The PBT control adjusts the bandpass of one shiftable IF crystal filter in relation to the bandpass of a fixed IF crystal filter. In effect, the IF fixed and IF shiftable bandwidths slide or shadow over each other such that a variable bandpass is produced. The pass-band tuning control covers ± 1.2 kHz. This equates to less than a 1 kHz bandwidth being available for CW. This is certainly adequate for casual CW operation, although more devoted CW buffs will want one of the optional CW filters. For RTTY, the standard filter using the PBT controls can be nicely set to pass just the 2295 and 2125 Hz tones. The Notch control covers from 250 to 2200 Hz and is very effective with a deep, clean notch throughout its range. It can easily take a tune-up tone out of an SSB transmission to preserve perfect copy, for instance. It has a slight de-

*c/o CQ magazine

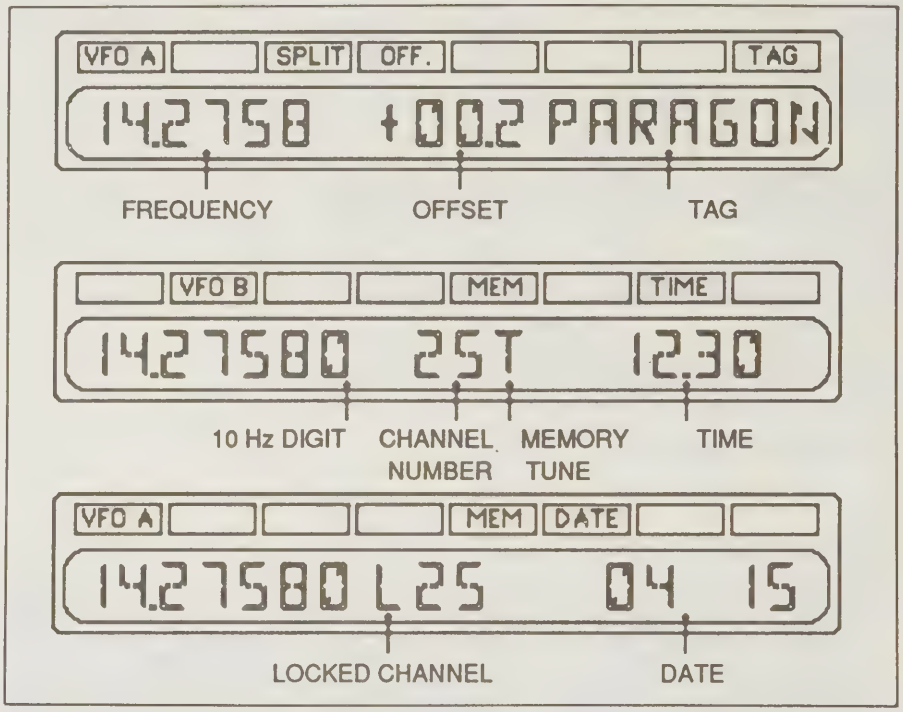


Fig. 1– This diagram illustrates just about all of the displays possible. You have to imagine that the large display is a soft fluorescent green color while the annunciators above are a backlighted yellow. The one display that is not shown is the one that will tell you which software version on an EPROM is installed in a Paragon.

sign fault, in my opinion, in that no on/off switch is associated with it. You must turn it fully CCW to effectively remove it. This is a plus in the sense that it is always ready to use, but on the other hand if you forget that the control is set at midrange, for instance, you might have to think for a moment or two as to why an SSB signal sounds a bit odd.

The Microphone/RF Power controls are straightforward. An LED indicator signals that the processor switch has been activated. The concentric RF Gain/Squelch controls carry forward the Ten-Tec idea of trying to keep the AF and RF gain controls separated, as most CW users would prefer. The squelch is operative in all modes and can be set for a sensitivity of down to 0.5 uV.

Indicators

The analog meter is nicely placed to the left of the main tuning knob such that one can easily glance at it or at the digital display. The meter is softly backlighted, and its scales are easy to read and checked out quite accurately. One might note, however, that the SWR scale readings are true only with 100 watts carrier output.

The digital display is a soft green fluorescent type. It looks simple enough, but in fact it has an extraordinary range of display functions. Fig. 1 presents a diagram of most of the display possibilities. There are eight annunciators above the digital display to indicate whether VFO A or VFO B has been selected, if Split frequency operation is being used, if Offset tuning is in use, if a Memory channel has been called up, Date if the date is called up, Time if time is called up, and Tag if you are entering memo information.

The left side of the digital display always indicates frequency (VFO A, B, or memory). A front-panel key selects, at will, if the readout should be to 100 or 10 Hz. The center display concerns itself with offset tuning information if either receive or transmit offset tuning has been selected (only one offset function can be used at a time). The display will indicate from +99.9 kHz to −99.9 kHz, a uniquely broad offset tuning range. In fact, for many split-frequency operations it obviates the need to get VFO A/B operation involved, thus adding a new dimension of versatility (a quality which is evident throughout the transceiver's design). The center display will display the memory channel number when a memory channel is called. Each memory channel stores frequency, mode, filter selected, and the alphanumeric tag. A display of all of these parameters comes up on the digital display and on LEDs when a memory channel is recalled. Besides channel number, the center display might indicate an **L** or a **T** to the left or right of the channel number. **L** means that the memory channel is locked out or bypassed during memory scan. **T** does not refer to a specific memory channel; it means that the main tuning knob is being used to tune through each of the programmed memories (including those locked out from scanning).

The Tag display is an other unique feature of the Paragon. Essentially, it's an electronic notepad. It can be used with either VFO, and a separate tag can be stored in each of the 62 memory channels. The uses for it, especially with the memory channels, are almost limitless. You can store next to a frequency the name of a net, alternate frequencies, an operator's name, a DX station's call, beacon locations, etc.—whatever you can make up using seven space locations, where each space location can contain any letter of the alphabet or any number from 0 to 9. A bonus feature of the tag display is quite interesting. The instructions for the microprocessor which controls the Paragon are stored in an EPROM. As more and more Paragons are produced and used, Ten-Tec many improve the EPROM software to add updates, improvements, and even better features. By some simple keypad entries, the tag display can be commanded to display the version number of the EPROM installed (e.g., VER 3-0). If an updated EPROM becomes available, and you feel it is worthwhile, you plug in the updated EPROM and the tag will display the version number installed—nifty modernistic feature, to say the least.

Mode	Normal	Normal Shifted	Fast	Fast Shifted
CW/SSB/FSK	4.8	9.6	9.6	24
AM/FM	24	48	49	240

Table I– Tuning rates, kiloHertz per turn of the main tuning knob.

Main Tuning Field

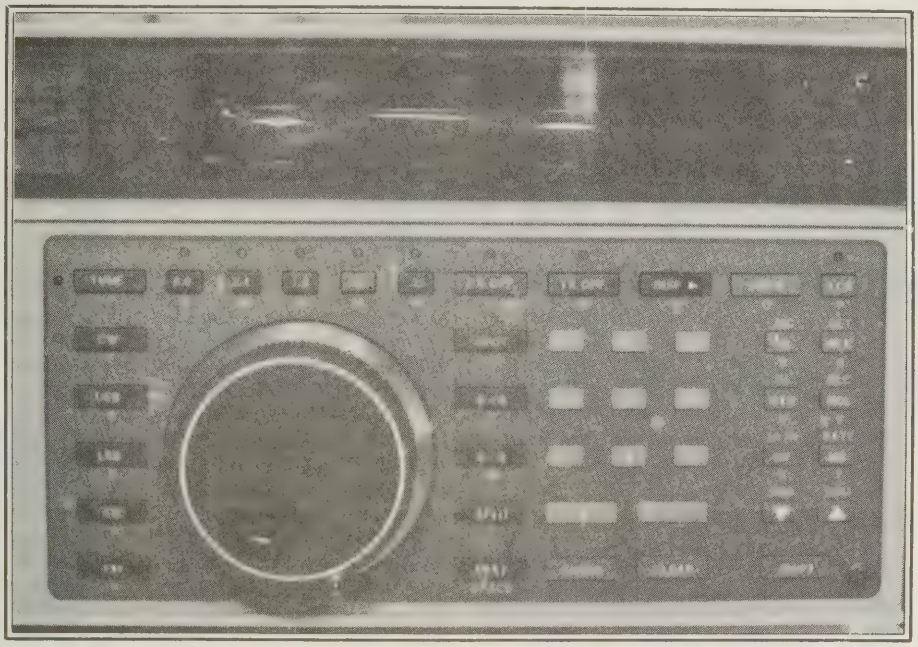
The main tuning field is dominated by the main tuning knob and then a large array of pushbutton or keypad switches and many LED indicators. A photograph illustrates the field.

First, as to the main tuning knob. It is slightly over 2 inches in diameter (excluding the metal skirt) and has a rubberized, textured, non-slip surface. There is also a convenient, recessed finger-tip indent for fast tuning. As with any transceiver, describing the tuning "feel" becomes quite subjective. So, rather than try to make superfluous statements, I would only say that the tuning "feel" is, by far, the best I have found on any Ten-Tec transceiver and extremely smooth. It's responsive yet comfortable to use for protracted operating periods.

The tuning rate depends upon both a key entry (normal, unless a fast option is chosen) and a shift feature which automatically increases the tuning rate when the main tuning knob is spun at a fast rate, regardless of whether the normal or fast tuning mode was selected. The various possibilities are summarized in Table I. I found the 4.8 kHz per turn rate to be excellent for normal SSB or CW operation, and when I wanted to shift quickly to a radically different part of a band, I found that selecting a different mode *temporarily* (e.g., AM) provided a quick, comfortable frequency change and was easier than spinning the tuning knob at a fast rate in the SSB mode. Only one-hand operation is required.

The reason why the just-described frequency change method was easy to use sort of leads me into the description of the very functional and easy-to-use keypad and LED display field around the main tuning knob.

The keys for mode selection (CW, USB, LSB, AM, and FM) are all very obvious to the left of the main tuning knob. A green LED indicator is associated with each key. Centered above the main tuning knob are keys marked 6.0, 2.4, 1.8, .50, and .25 with associated green LED indicators. These keys easily choose the various IF filters (6.0 and 2.4 kHz are standard; other filters are optional). To the top of the mode keys and to the left of the filter keys is a very functional one marked TUNE with an associated LED. Pressing the key automatically puts the transceiver into the CW mode and closes the PTT line. The protective circuitry keeps the



The right or "digital" side of the front panel.

output power at a suitable level if you have to adjust an antenna tuner, and the power output will rise to its full level as the SWR level falls below 1:1.5. Alternatively, any level of power output below the full value can be set by adjustment of the RF Power control. One presses the key again to return the transceiver to whatever mode it had previously been set up to use. It's an extremely convenient tuning method.

To the right of the main tuning knob are various keys associated with offset tuning and the use of the dual VFOs. Most of them are quite self-explanatory. The RX and TX offset keys activate those functions and each has an associated LED. The A/B and Split keys provide switching between either VFO, equalizing the frequencies in each VFO and setting up split operation such that one VFO controls the receive frequency and the other VFO controls the transmit frequency. Split operation may be in-band or cross-band. An interesting bonus is that when you use the main tuning while the split feature is activated, only the frequency displayed (VFO A or B) is changed.

The SPOT key allows you to zero-beat the transmit signal with the received one in CW.

The keys marked 1 through 0 and the decimal point one (.) simply provide for direct frequency entry and will be touched upon later.

If we quickly jump to the keys marked HBD, HBU, and SHIFT at the lower right edge of the panel, you can appreciate the simple yet sophisticated bandswitching operation of the transceiver. When the FAST tuning key is off, the HBD or HBU keys move the displayed VFO frequency up or down in continuous 100 kHz steps. If the FAST key is on, the step amount is 1 MHz. If the shift key is activated, the HBD/HBU keys will move the transceiver continuously up or down through the amateur bands only until one of the keys is released. The less obvious advantages of this particular bandswitching scheme really can only be appreciated when you actually use it. For instance, for normal amateur band operation you can switch between amateur bands as desired (SHIFT key on) and then when you are within a desired band, use the HBD or HBU keys (FAST key off) to get immediately to the desired 100 kHz portion of a band. It's immensely convenient compared to the endless manipulation of the main tuning knob required on many trans-

ceivers to get, for instance, from the SSB portion of 10 meters to the FM portion of the band.

If you are comfortable with understanding just the basic features of the Paragon, the foregoing description should be sufficient to illustrate that the Paragon is an extremely versatile and unique transceiver. It really is an easy transceiver to operate and has a tremendous array of advanced features most of which are easily controlled by the keys to the extreme right of the main tuning field. All of the keys are easy to use and understand. A "blow by blow" description of each key would probably not prove too much, so I will just highlight a few of the features.

• **Storing information in a memory channel.** You set up the frequency, mode, VFO (A or B), and filter selection. Then you press the STO key and the desired two-digit memory channel number. All the information described will be stored. If you don't know which channel number to use, press the STO key followed by the ENTER key. The transceiver will automatically choose the next available memory channel, *and* the display will then show the memory channel used! The notation FULL will be displayed if all memory channels are full, since you then have to erase a memory channel if new entries are to be stored.

• **Recalling a memory channel.** This operation is extremely simple. Just press the RCL key and then from the numeric keypad the two-digit memory channel number. You can recall any of the 62 memory channels in this manner. If the main tuning knob is adjusted during recall, the memory frequency is immediately transferred to a VFO and it becomes completely tunable. If you are within an amateur band, transmit operation is immediately available.

• **MT (Memory Tune).** When this function is used, the main tuning knob controls the manual selection of all of the programmed memories. It sounds like a simple control, but in fact it can be extremely useful and powerful. Depending upon how you have programmed the memories, you can check various amateur bands, beacons, SW broadcast stations, etc., in an extremely quick fashion. I think a DXer will find it to be a very powerful tool.

• **Scratch Pad Memory.** This function provides a method by simple key manipulation whereby you can temporarily store and recall a single frequency without affecting any memories. Entering a new frequency erases the previous entry.

• **Memory Scan.** The transceiver will scan through all of the memory channels except those which are locked out. The length of time that the transceiver stops at each memory location is adjustable. A RATE key allows you to choose from 10 different scan rates, ranging from a few seconds' hold on each memory channel to a very fast sweep. Scanning must be manually stopped.

• **Memory Lockout.** You can simply lock out from scanning any given memory channel or sort of do the reverse. That is, you can temporarily lock out all of the memory channels and then just selectively unlock several desired channels. None of the information in memory is changed during these operations.

• **Frequency Readout.** One key function determines if the frequency readout will be down to 10 Hz or 100 Hz.

• **Tag Entry.** You might note that many keys have a single letter as a sub-label. The function of those keys can be shifted temporarily to allow the entry of any letter for a frequency tag.

• **Frequency Entry.** Frequencies can be selected by the main tuning knob or by keypad entry. The keypad entry system is very straightforward. You simply punch in the frequency immediately and then press the ENTER key. Entering the decimal point tells the transceiver when the MHz portion of the entry has ended. Leading or trailing zeros do not have to be entered. It's so simple that I very often use it to bandswitch the transceiver.

The Paragon has a lot of powerful features and a lot of controls. However, I feel the controls are all logically and conveniently arranged. You might need a "crib sheet" when first using the transceiver, but after a few hours of trying out its features, it should no longer be necessary. All of the most often used controls are on the front panel. There are no hatch covers, recessed controls, etc.

Memory Retention

The memory-retention system used in the Paragon requires for normal operation that the transceiver continue to be supplied with power supply voltage when not being operated. (The front-panel power switch does not remove power to the logic circuits.) When the unit is being transported, an ordinary 9 volt alkaline battery can be installed and will provide about 150 hours of backup power. Of course, it can be left installed at all times to provide backup during AC line power outages.

The idea of having a power supply turned on all of the time may disturb some operators, but you should evaluate the situation. The Ten-Tec power supply draws 25–30 watts from the AC line on standby. That equates to a cost of 50 cents to $2.00 per month, depending on the kw/hour rate in your location. That has to be balanced against the fact that no special battery ever has to be replaced within the transceiver. There are alternatives such as using a 9 volt rechargeable battery which is kept under trickle charge or a separate 9 volt supply. However, I've had the Ten-Tec power supply "on" for months without any problem. Perhaps the idea doesn't disturb me because for years I've lived with transformers in broadcasting or power distribution systems that are never turned off and, in fact, have been "on" for over 30 years.

Part III of this article will be devoted to personal operating experiences and impressions concerning on-the-air use of the Paragon, plus a review of some accessories. CQ

(To Be Continued)

CQ REVIEWS:

Ten-Tec's Paragon HF Transceiver

Part III — Operating Results and Accessories

BY JOHN J. SCHULTZ*, W4FA/SV0DX

The Paragon tested (serial No. 00102) has been in almost constant use over a six-month period, usually with a Titan linear amplifier. All modes were used, but the concentration of operating time was on SSB. About the best understatement I can make is that the Paragon is suitably named. Starting with the first operating day, I had the impression that the Paragon represented a different class of transceiver, and that impression remains to this day.

If I had to find a few words to summarize my impressions about the Paragon, I would choose quietness, convenience, and punch. The quietness on receive has two main advantages: Weak signals seem to pop out of an almost totally quiet background for enhanced readability, and using the receive mode for extended periods does not become tiring. DXers as well as those who spend a lot of time just "listening to the mail" will appreciate its receive performance, especially since it is coupled with a very smooth main tuning knob action. Once you become used to the giant keypad around the main tuning knob, the convenient way it is laid out becomes more and more apparent. The keys that you are likely to use most often are grouped closest around the main tuning knob. One of the LEDs or some change on the main display alerts you to any status change of the transceiver. The analog controls have a firm but smooth feel to them. I would have voted for a slightly different arrangement of the controls, particularly grouping all of the selectivity-type controls more around the AF gain control, but that is strictly a personal preference.

The punch of the transceiver was amply demonstrated numerous times as I cut through the huge European pileups to work DX like 9V, 6W, and BY stations. At the same time, many stations, especially those from G-land, took time out to mention that my audio sounded strong and dominant, but not rough (I almost always left the processor turned on). One operator at HZ1AB summarized it best, I guess, when he simply commented that the audio sounded "superb."

With regard to CW operation, I received many compliments regarding the keying quality of the Paragon. I could only test the QSK up to 20 wpm plus because of my own operating ability. However, a single "dit" at 20 wpm would easily be discernable as I was transmitting so I could break my transmission to listen. I estimate the full QSK to be viable to at least 35 wpm for dyed-in-the-wool CW buffs.

I still haven't filled all of the 62 memories, but over a period of time I have entered quite a few beacon frequencies, broadcast frequencies, and DX net information. The tag display is immensely useful to keep track of net times and things like beacon locations. If you obtain some of the optional filters, you will rapidly appreciate the fact that although a memory will store filter and mode information, the filter and mode functions are completely switchable even after a memory channel has been recalled. Any filter can be selected in any mode (except FM where the 15 kHz one is automatically selected). Therefore, one can enjoy quasi hi-fi on SSB receive using the 6 kHz filter when conditions permit, at one extreme, and try to dig a shortwave broadcast station out of the QRM or noise using the narrow SSB filter.

Besides being a more than state-of-the-art radio from a technical viewpoint, I just plain found the Paragon to be a thoroughly enjoyable radio to use. It sort of in-

*c/o CQ magazine

Input Voltage: 109–125 VAC or 218–250 VAC, 50–60 Hz
Output Voltage: 13.8 VDC, internally adjustable from 11.5 to 15.0 VDC
Output Current: 20 amps full load, 22 amps maximum for 5 minutes
Current Limiting: Electronically disables output. Factory set threshold at 22 amps
Regulation: – 3% at output connector for no load to 20 amps full load
Ripple: 20 mV peak to peak at 20 amps
Speaker Impedance: 8 ohms

Table I– Specifications for the Model 960 Power Supply/Speaker.

vites you to use it rather than present a front panel which challenges the operator to remember how to use it.

Manual

The manual supplied with the Paragon guides you very easily as to how to use its features. It initially gives installation guidelines which are complete enough except if you're using a full QSK amplifier. I did have to refer to the Titan manual also to get the interconnections to the amplifier correct. The manual then goes on to a one-page condensed operating instruction summary which is great. It quickly points out all the control settings and frequency selection methods so you can have the transceiver operating on amateur band SSB or CW within a very leisurely 5–10 minutes.

The next section of the manual is entitled "Detailed Operating Instructions," and this is where you really get to know how to use the transceiver. The information is conveyed rather neatly in little "tidbits." Small, logically connected groupings of the keys or analog controls are discussed in individual blocks, or some blocks may illustrate and explain just one key function or analog control. With the transceiver in front of you, all of the information is very easy to understand. Trying out all of the functions is quite interesting, and I would suggest that this part of the manual be digested in leisurely steps.

Other parts of the manual go on to give operating hints, what-to-do in case of trouble hints, options installation information, and circuit descriptions. The demand for the Paragon sort of overwhelmed Ten-Tec, and the latter section of the manual was not included with early production runs, although by now all owners of the transceiver should have received the complete manual.

I worked with preliminary copies of various diagrams, and it was quite evident that Ten-Tec was determined to get them complete and correct before incorporating them in the manual. The diagrams with which I worked contained quite complete information regarding things such as component identification and test-point voltages on each PC board. The information, overall, does not constitute a complete alignment and service manual. However, an experienced amateur can certainly use the diagrams to track down minor problems, if they should ever arise, or use them for technical communications with the Ten-Tec service people.

Options/Accessories

The filter options, mentioned previously, have been available since the Paragon

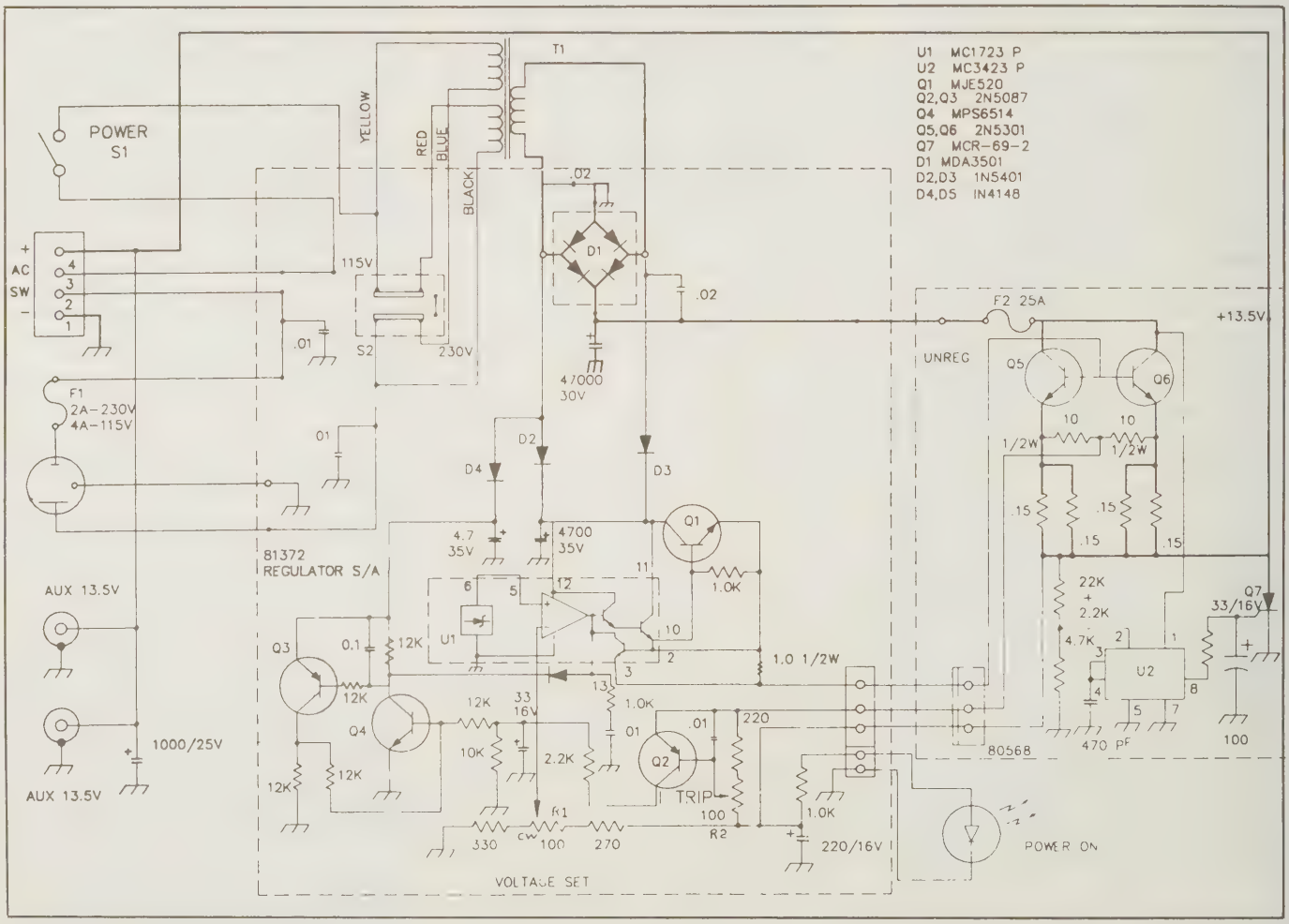


Fig. 1– Schematic of the Model 960 Power Supply.

was introduced. The Voice Readout, RS232 Interface, and FM Adaptor options were all held up from lot production due to the initial demand for the transceiver. They should be available now. The Voice Readut option, Model 257, announces the displayed frequency whenever the **VOICE** key is displayed. The output level is adustable. The RS232 Interface, Model 258, provides computer interface. It comes as a package that includes a plug-in PC board, RS232 connector and cable, and a listing of the command codes to access the Paragon's microprocessor. The FM Adaptor option, Model 256, is a PC board that locates within the transceiver near a synthesizer sub-chassis. It provides transceive ±5 kHz FM deviation.

Two Ten-Tec accessories that were actually used with the Paragon that was tested were the Model 960 Power Supply/Speaker and Model 705 Electret Microphone.

The Model 960 Power Supply is a rugged unit that supplies 20 amps at 13.5 VDC (regulated) from a 115/230 VAC, 50/60 Hz source. Table I presents the specifications for the unit. You might note the wide input voltage acceptance range and the relatively "stiff" regulation even at 20 amps output.

Fig. 1 presents a schematic of the power supply. The in/out connections are quite standard, except that you might note that *two* auxiliary 13.5 volt output connectors are provided for accessory items. The basic circuitry revolves around D1, a full-wave rectifier, and two 2N5301 pass transistors (heavily heatsinked) as controlled by U2, an MC3423P voltage regulator.

The circuitry has several interesting features which are more sophisticated than those evident in previous Ten-Tec power supply designs. Q3 and Q4 provide over-current shut-down action driven indirectly by the voltage drop across R2. When the output current exceeds 22 amps, the power supply will shut down until you recycle the on/off switch on the power supply (not the power on/off switch on the Paragon transceiver). The power supply also has over-voltage or "crowbar" protection. This type of protection dates back decades as far as broadcast transmitters are concerned, but it's not all that common in amateur designs. Basically, it's a protective circuit that *shorts* a power supply output when an over-voltage output condition takes place. The idea is that it's better to blow a power-supply fuse or have a circuit breaker trip than to damage an expensive transmitter or transceiver component. In order to be effective, a "crowbar" operation has to be very fast, and it certainly cannot be done unless a power supply is very carefully designed such that repeated overloads ("crowbars") activate only the protective circuitry in a power supply and do not cause damage to the main transformer or solid-state devices. The "crowbar" circuit (U2 and Q7) in the Model 960 does just that and is set at a threshold voltage of 15.9 VDC. Even momentarily high supply output voltages (e.g., those caused by a lightning strike near the AC power line feeding the power supply) will cause SCR Q7 to "crowbar" and either trip the over-current circuit or blow the line fuse (F1) or the internal fuse (F2, 25 amps). In any case, unless some *very* unusual voltage spike or current peak takes place at *either* the input or output terminals of the power supply, it is very well equipped to protect itself. The worst that can happen is that you will be faced with the minor inconvenience of replacing the line fuse (externally accessible) or the doubly-protective 25 amp fuse (internally accessible) or having to recycle the on/off switch to reset the overcurrent protective circuit.

The supply has a built-in speaker which provides a bit more "presence" to the received audio as compared to the upward facing internal speaker in the Paragon. The front-panel plexiglass window can easily be removed, and you can insert behind it a label of your own design to dis-

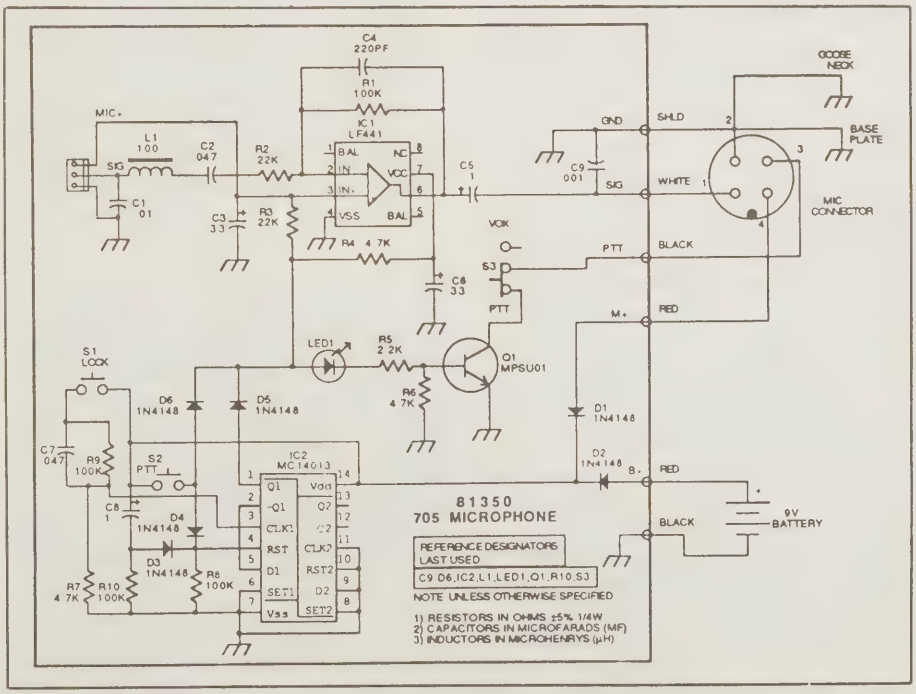


Fig. 2– Schematic diagram of the Model 705 Microphone.

play a station's call sign. Overall, the supply is extremely well designed, and it's hard to imagine how almost any sort of electrical abuse could damage the unit.

The Model 705 microphone is a very light-weight electret type. The specifications for it are shown in Table II. It is an amplified type of microphone, and its schematic is shown in fig. 2. IC1 is a low-noise preamplifier, while IC2 in conjunction with Q1 forms a latching/switching circuit to provide either for momentary or locked PTT operation via two key switches on the microphone. An LED signals that the PTT line has been grounded. The microphone can be powered by an internal 9 volt battery or directly over the microphone cable from most Ten-Tec transceivers, including the Paragon.

The unit is so light (about 8 ounces without a battery) that at first you tend not to develop too much respect for the unit. However, it is really a quite good microphone. I didn't do a frequency response run on the microphone, but I did audibly compare its response to that of several other microphones I had in the shack. The 705 has a clear, very intelligible response with, what I would call, not being bassy or overly crisp. I suspect it all comes about from a combination of the electret element itself plus a bit of frequency shaping as provided by the dimensioning of the components associated with the low-noise preamplifer, IC1.

Type: Electret condenser microphone
Sensitivity: −52 dBv (0 dBv = 1 v/μBar at 1 kHz)
Output Impedance: Works into any circuit of 100 ohms or more
Maximum Sound Pressure Level: 130 dB
Battery Type: 9 volt alkaline transistor battery
Electronics: C-Mos PTT switch, C-Mos signal amplifier, NPN T/R transistor
Current Required: Receive mode less than 2 microamperes; transmit mode 2 milliamperes typical, with 9 volt battery
Semiconductors: 2 ICs; 1 transistor; 7 diodes
Weight: 12 ounces including battery

Table II- Specifications for the Model 705 Desk Microphone.

If you do invest in a Paragon, I would also strongly advise considering the purchase of the 960 Power Supply and 705 Microphone.

Epilog

Through a rather inept move on my part, I had to call on Ten-Tec's service department. I tried to reposition the annunciator screen on the transceiver, but in the process the screen fell off. I had the feeling that I was turning a minor thing into a disaster, since I had the front panel partly removed to get at the screen, and I had also disconnected many cable leads.

I sent the transceiver back to Ten-Tec. Within ten days it was back. Not only had a new screen been installed, but the bottom internal cover had been replaced by an updated one, the transceiver had been realigned, a cold solder joint on an IF filter had been repaired, and the software had been updated to the latest version! There was no service charge. Now if that isn't top-of-the-line service for a top-of-the-line rig, I'm lost for words.

Here are some last-minute notes of interest. The Paragon now comes with a 100-plus page combined operating and service manual which is absolutely complete with detailed circuit descriptions, board circuit traces, component layouts, etc. Serial numbers 395 and above incorporate a 3 ma trickle charge to the 9 volt memory back-up battery so a nickel-cadmium type can be used. Earlier serials can be modified easily. Also, several options are now available as to how the "spot" button can be used via a programmed plug-in chip. It's all explained in the manual. CQ

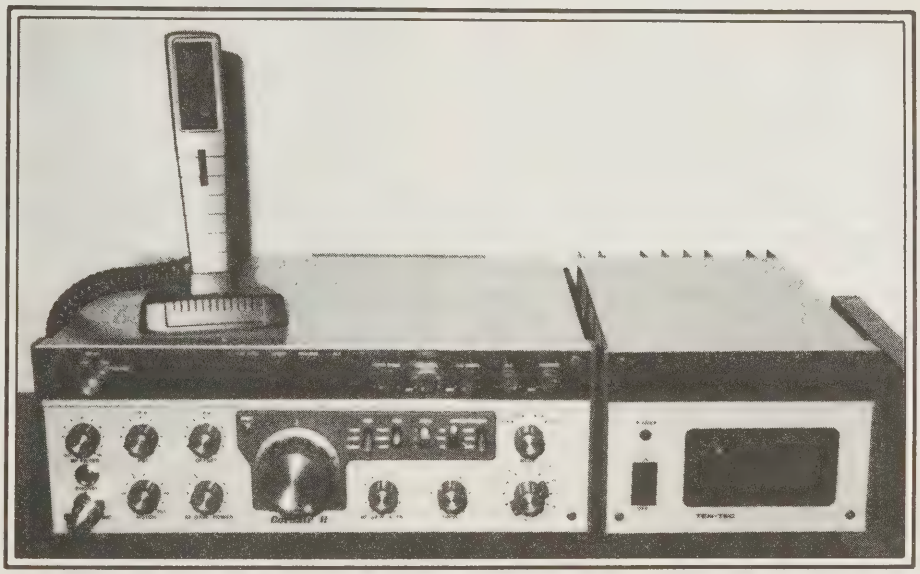
CQ REVIEWS:

The Ten-Tec Corsair II Transceiver — Part I

BY JOHN J. SCHULTZ*, W4FA/SV0 DX

Unpacking a new transceiver from its shipping container has always been an exciting experience for me because no matter how much advertising copy one sees on a given transceiver, there is nothing like viewing the actual piece of equipment. So when I did unpack the Corsair II from its very well protected shipping container, I was immediately impressed by its bright, new styling as compared to the current trend of most transceivers to be styled in rather dull, darkish, "military" tones. The Corsair II has bright styling in that its front panel is done in a very light gray tone, and the various control knobs and cabinet trim panels continue the gray color theme in slightly darker shades. The color scheme reminded me very much of the latter series of the former Collins S-Line equipment.

Anyone who is really interested in the Corsair II, however, is certainly going to immediately ask if there is anything more to the Corsair II than a new "paint job." Well, that was exactly my question, since I was very well acquainted with the original Corsair transceiver. Therefore, I began to look around the outside and inside of the Corsair II, and I did indeed notice some significant changes. An extra front-panel Bandpass Filter control has been added, many of the smaller front-panel controls have been completely changed to provide for keyer speed control (a new feature), independent noise blanker level and width controls have been added, etc. On the back panel, various phono jacks have been added for 12 VDC accessory devices, and a keyer paddle jack and three controls for VOX operation (Gain, Delay, and Anti-VOX) have been added. Internally, several new shielding and PC-board arrangements are apparent. Indeed, as it became apparent later when the actual PC-board circuitry was studied, major circuitry changes were made on various boards, and some completely new boards were introduced. It seemed fairly clear that the Corsair II deserved a detailed review on its own. Also, since the original Corsair transceiver was introduced well over two years ago, many newer amateurs are probably not acquainted with the original unit. In order to cover as many readers' interests as possible, I'll describe the Corsair II from the "ground up" and try to highlight now and then some of the interesting features that make the Corsair II different from the original Corsair.



The Corsair II together with its matching Model 260 Power Supply.

General

The Corsair II is a 100 watt output class transceiver designed for use on any mode and on all existing and proposed amateur bands. Detailed specifications for the transceiver are shown in Table I. Users interested in operation out-of-band (e.g., MARS) might notice the PTO overrun on the band edges. Compared to the original Corsair, the Corsair II specifications present some interesting changes. A few of them:

1. Five IC's and a few more diodes have been added.

2. The receive selectivity has been increased by using a 16-pole crystal ladder unit with a better shape factor.

3. A new variable audio bandpass filter centered on 750 Hz has been added.

4. Adjustable blanking width, to complement the adjustable threshold, has been added to the noise blanker.

5. The dynamic range on receive has been increased from 90 to 95 dB.

6. Receiver recovery delay is specified for the first time (a first for any transceiver manufacturer).

7. On transmit, the SSB filtering has been increased from four to eight poles.

8. An internal keyer has been added, as a standard feature, which covers 8 to 50 wpm and which has a 40-character read/write memory.

9. On transmit, unwanted sideband suppression has been increased by 15 dB.

10. Numerous front-panel and rear-panel controls and connectors have been rearranged.

To say the least, the crew from the "Tennessee Technology Corridor" (that's from a label on the bottom panel of the transceiver) has done far more than just repaint the original Corsair. In fact, from what I have learned from Ten-Tec, they intend to continue to produce the Corsair series for a long time to come.

*c/o CQ Magazine

Say You Saw It In CQ

The RF preamplifier stage in the Corsair II can still be switched in or out, various optional filters are available, and the passband tuning feature is retained along with selectable AGC, notch filter, RIT/XIT, etc.

On transmit, a full 95–100 watts output is easily achieved without the use of any cooling fan *whatsoever*, either on the transceiver itself or on its optional mating Model 260 power supply. The only caution Ten-Tec recommends is that when the Corsair is used key-down for more than 20 minutes (!), a small external fan should be directed on the transceiver's heat sink. the reason for this is not that the final transistors will burn up, but rather that the heat sink will become so hot (200 degrees F) that touching the heatsink accidentally might result in a serious finger burn. The now rather famous Ten-Tec full break-in operation is available on CW complete with CW sidetone. The metering includes forward peak reading power, SWR (without any "set" meter preset), speech processing monitoring, and final collector current reading. Table I doesn't mention speech processing, but there is definitely a very good AF-type speech processor in the Corsair II.

All in all, the Corsair II does deserve a bit of a detailed examination, and so we shall proceed.

Corsair II Specifications

General

Frequency Coverage: 1.8–2.3, 3.5–4.0, 7.0–7.5, 10.0–10.5, 14.0–14.5, 18.0–18.5, 21.0–21.5, 24.5–25.0, 28.0–30.0 MHz transceive. (VFO provides approximately 40 kHz overrun on each band edge.)

VFO Stability: Less than 15 Hz change per degree averaged over a 40 degree change from 70 to 110 degrees F after 30 minutes warmup. Less than 10 Hz change 105 to 125 VAC line voltage when using a Ten-Tec power supply.

Tuning Rate: Vernier, 18 kHz per revolution, typical.

Readout: 6 digit, 0.3" LED numerals.

Accuracy: ± 100 Hz.

Semi-Conductors: 1 LSI, 25 IC's, 94 transistors, 109 diodes, 6 LED readouts.

PC Boards: 22 PC assemblies with plug-in cables.

Construction: Rigid steel chassis. Extruded aluminum front panel with two-tone gray inserts. Textured gray top and bottom, snap-up stainless steel bail.

Transmitter

DC Power Input: Maximum 200 watts at 14 VDC CW and SSB. 100% duty cycle for up to 20 minutes.

RF Power Output: 85-100 watts, typical.

Output Impedance: 50 ohms, unbalanced.

Microphone Input: High impedance. Accepts high- or low-impedance microphones with 5 mv output. Polarizing voltage available for electrets.

T/R Switching: VOX or PTT on SSB. Instant break-in or semi-break-in on CW.

CW Sidetone: Internally generated. Adjustable tone and volume independent of AF gain control. Operates only in CW mode.

Programmable Iambic Keyer: 8–50 wpm with 40-character memory.

SSB Generation: 9 MHz, 8-pole crystal ladder filter. Balanced modulator.

Carrier Suppression: 60 dB typical.

Unwanted Sideband Suppression: 60 dB typical at 1.5 kHz tone.

Spurious Output: Better than −45 dB relative to full output.

Meter: Forward power, collector current, SWR, audio processing level. Selectable 4-position switch.

CW Offset: 750 Hz, automatic.

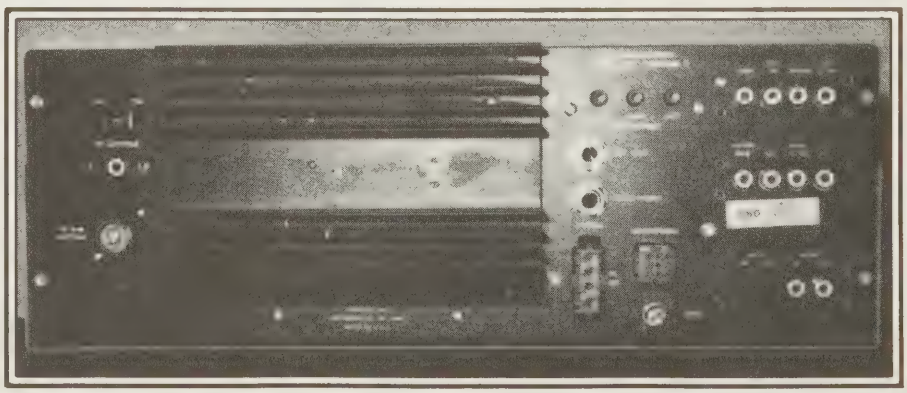
ALC Control: Front panel adjustable. 30 to 100 watts output, LED indicator.

Table I– Corsair II specifications.

Circuitry

The basic block diagram of the Corsair II is shown in fig. 1. Basically, the Corsair II is also a single conversion design using a 9 MHz IF but with an additional down/up frequency conversion to provide the passband tuning feature. The PTO feeds a variable 5.0 to 5.5 MHz signal into the "Osc./Mixer" board where that signal is mixed with the output of a crystal oscillator so the signal going into the "RF Mixer" board is correct to work with a 9 MHz IF. For instance, for operation on 40 meters, 7.0-7.5 MHz, the PTO output frequency is translated to 16.0–16.5 MHz in the "Osc./Mixer" block. In this manner, full 500 kHz coverage is obtained on the 1.8, 3.5, 7.0, 10.0, 14.0, 18.0, 21.0, 24.5, and 28.0 to 30.00 MHz bands (the latter in four 500 kHz ranges). Crystals are included for the 10.0, 18.0, and 24.5 MHz bands, and the Corsair is ready to go on those bands. A few bonus features are that the PTO range actually has about a 30–40 kHz overrun on band edges so many MARS frequencies are covered, the 1.8 MHz band extends to 2.3 MHz to cover part of the Marine band, and the 10 MHz band includes, of course, WWV.

In the receive mode, incoming signals are no longer routed through the lowpass filter assembly, but rather directly via a diode switch on the LL (low level) Driver board to the BPF (bandpass filter) board. The latter contains separate, multiple-pole filters for each band. The signal is then routed to the RF Mixer board which is shown, in detail, in fig. 2. A 2N3866 (Q3 in fig. 2) is still used as the RF amplifier stage, but a great many circuit details have been changed on the board. The RF amplifier stage is a broadbanded, no-tune design and can be diode switched in or out. After passing through the amplifier stage, the signal is routed to a double balanced mixer which uses an integrated diode assembly, D13. The local oscillator signal comes in from the left (terminals marked L0), and the incoming signal is translated down to the 9 MHz IF in the mixer stage. It then proceeds to a low-noise amplifier stage, Q6, and some broad IF filtering (Y1). The signal then "splits," partly exiting via Q7 to the noise blanker and partly proceeding via more broad IF filtering (Y2) to the balanced diode switch assembly (D9–12) which is controlled by the noise blanker. Detection of fast-rise spike-type noise pulses by the noise blanker causes it to generate a blanking signal which gates Q5 and causes the balanced diode switch assembly to instantly interrupt the IF signal flow. It would be impossible to go into all the circuitry changes on the RF Mixer board, but obviously a lot of effort was devoted to improving the signal-handling capability, improving the purity of the



The rear panel. Note that there is no blower fan! Enough connectors for external accessories are provided to satisfy just about any application.

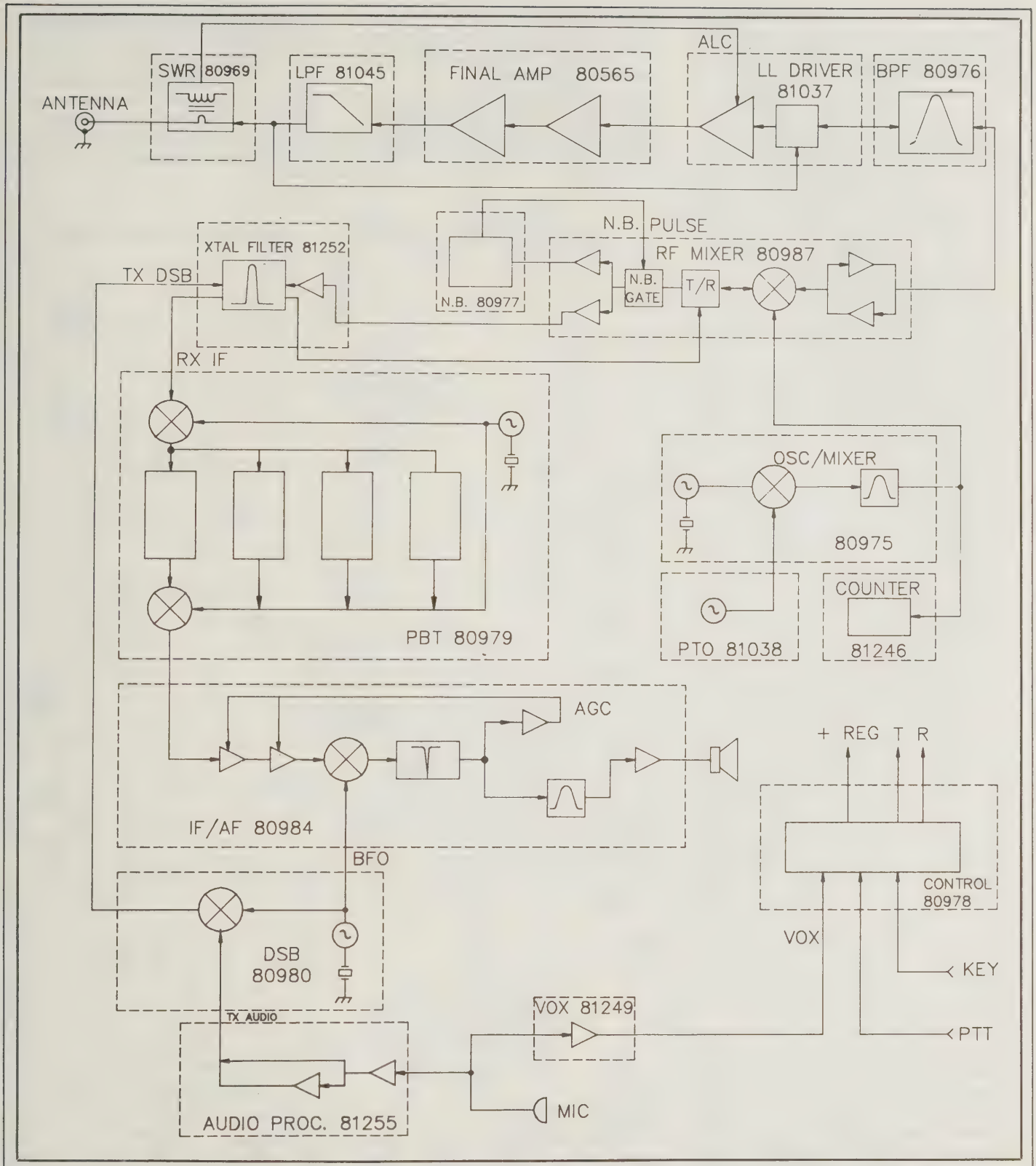


Fig. 1– Block diagram for the Corsair II.

mixing process, and adding extra filtering to the IF signal. The signal is next routed to a new crystal filter board which contains a standard 8-pole, discrete crystal filter. It sets the basic IF bandwidth on receive and acts as the SSB filter on transmit.

On receive, the signal then continues to a passband tuning board. The board contains a standard 8-pole, 2.4 kHz SSB filter with provisions for optional 8-pole 1.8 kHz SSB, 6-pole 500 Hz CW, and 6-pole 250 Hz CW filters. Ten-Tec must have been quite satisfied with the design of this board, since nothing more than a few minor resistor values have been changed over the original design. For that reason, the schematic diagram is not presented. The idea of its operation remains the same, of course. By varying the injection frequency to mixer stages

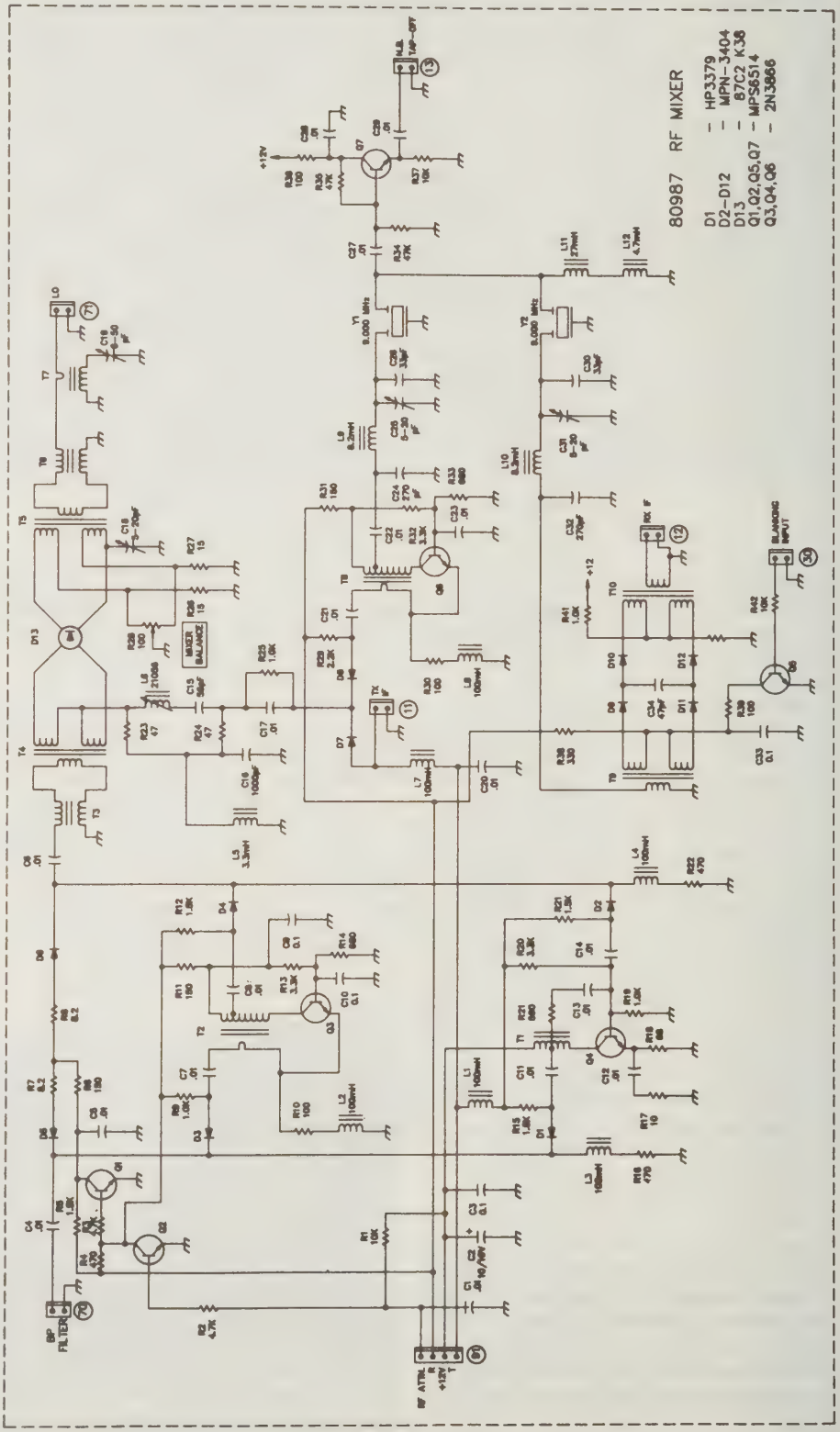
both before and after the filters on the board, the passband of the chosen filter on the board is moved across that of the preceding 8-pole SSB filter on the new filter board which was previously mentioned. One can imagine two doorways physically moving across each other to provide a full doorwidth opening or an extremely narrow opening. In any case, using just the standard filters supplied with the Corsair II, one has 16 poles of IF filtering and using the passband tuning feature one can vary the IF bandwidth on receive from 2.4 kHz to roughly 600 Hz.

After the passband tuning board, the signal is routed to the IF/AF board. This board has also been significantly redesigned and is presented in fig. 3. The board handles most of the receive functions including RF gain control, audio notch and audio bandpass filters, AGC action, S-meter control, audio amplification, and CW sidetone. One can pretty much see the signal flow around the board from the RX IF input point through IF amplifiers Q1 and Q2, demodulator Q4, through the notch filter stages of U1, the bandpass filter stages of U3 and U4 and, finally, to U5 as an audio output amplifier. The notch filter is tunable from about 200 to 3500 Hz with a 50 dB notch. The bandpass filter, a new feature, has a fixed center frequency of 750 Hz, but can be controlled to produce a flat audio response or one that increasingly peaks at 750 Hz until it reaches a 200 Hz bandwidth with skirts rolling off at −24 dB/octave. The use of the two audio filters plus the use of the variable IF passband tuning pretty much negates the need for an optional CW IF filter for the casual CW operator. The AGC is of the time delay or "hang" type, and it does follow the setting of the audio notch control. The sidetone oscillator on the board has both adjustable pitch and volume controls. A bit complicated spotting oscillator circuitry which runs back and forth among several PC boards produces a 750 Hz signal, the same as the IF offset on CW. A front-panel pushbutton control zero beats incoming signals for exact frequency spotting.

In the transmit mode one can, more or less, visualize the circuitry as working backwards if one follows the signal flow arrows in fig. 1. The microphone signal is split and goes to both the VOX and Audio Processor boards. The latter board in the Corsair II has been extensively redesigned and is shown in fig. 4. Basically, the circuitry conditions the audio through a process of compression followed by soft clipping. U2B is the compression stage, the output of which partially couples to U3B, which in turn drives Q1 as a shunt element at the input of U2B. D3 and D4 are the clipping elements. The processing level is adjustable by a front-panel control. The VOX circuitry has been moved to a separate new board, and the three controls associated with the VOX function (gain, delay, and anti-VOX) have been installed as rear-panel controls on the Corsair II, since they usually require only infrequent adjustment.

After passing through the speech processor board, the AF signal goes to a DSB board where a double sideband signal is generated. The DSB signal passes through the standard 8-pole 2.4 kHz SSB filter and then on to the RF Mixer board where it is translated to the final output frequency. The signal is then amplified in various stages until it reaches a pair of MRF-458 transistors which operate in a push-pull Class AB configuration with 200 watts DC input on all bands. The PA stage

Fig. 2– The "front end" of the Corsair II underwent various design changes.



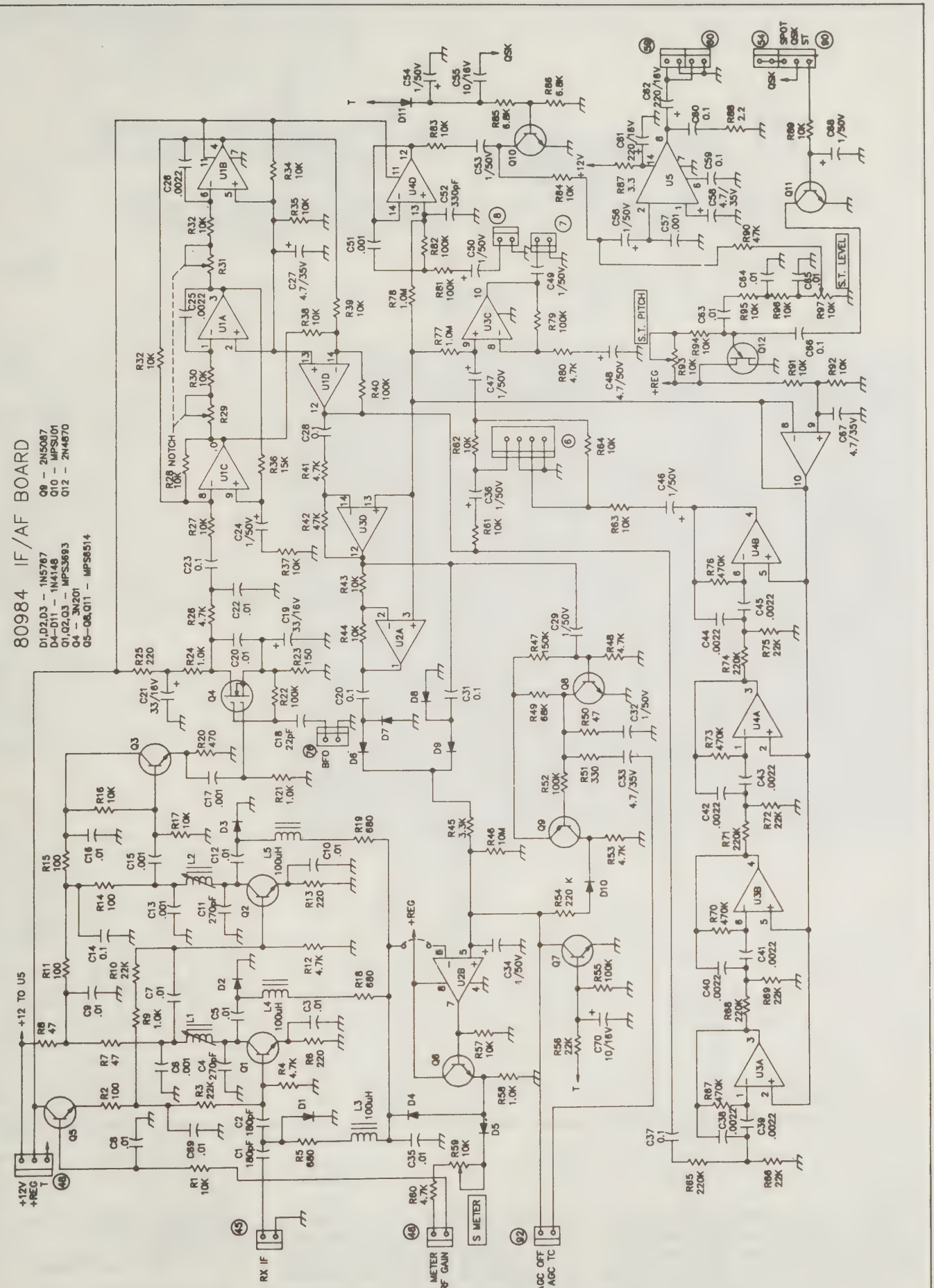


Fig. 3– The IF/AF board. Functions are discussed in the text.

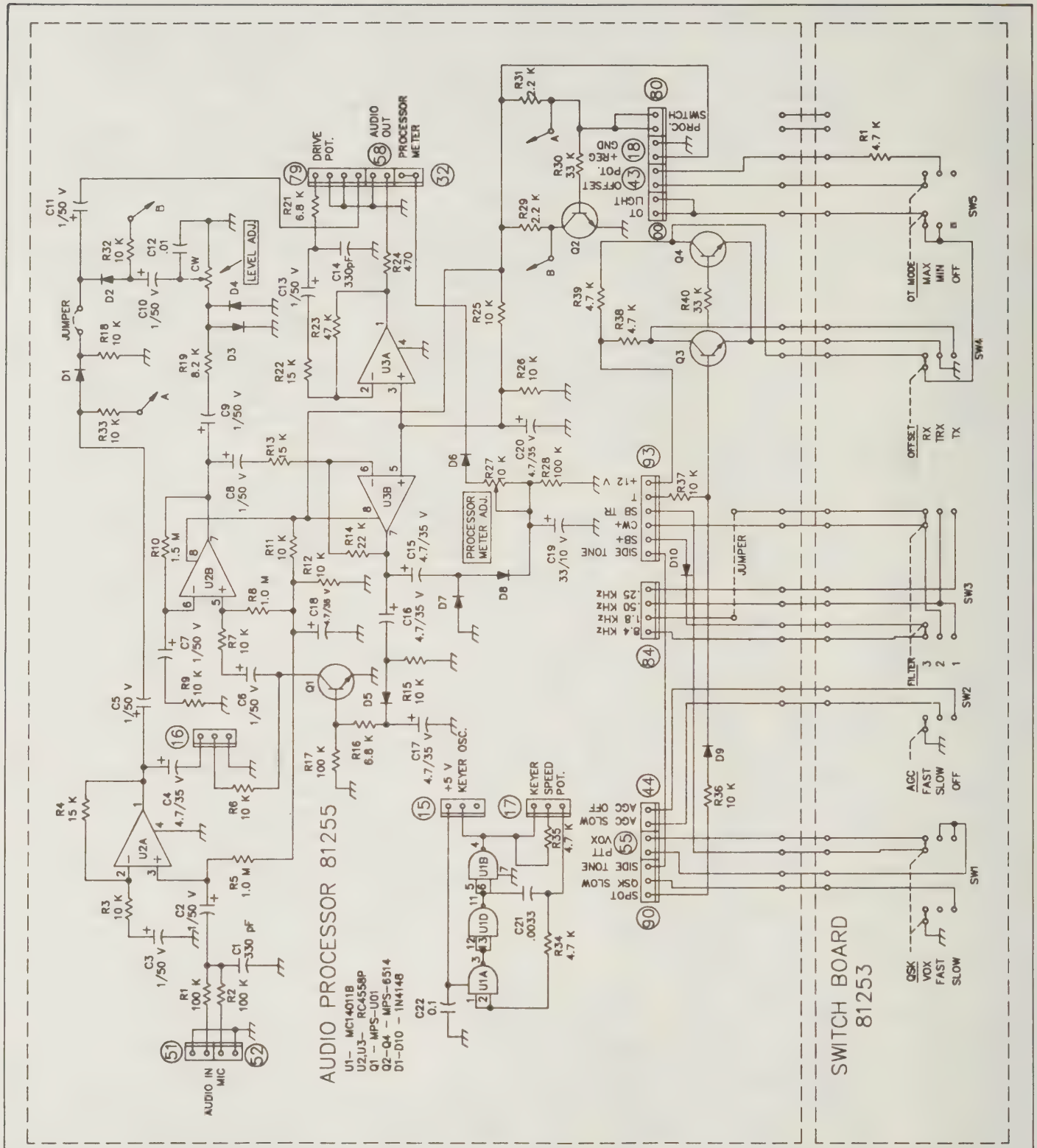


Fig. 4– The audio processor board. The processing uses a combination of compression and soft clipping and is very effective.

is followed by switched low-pass filters and a SWR detection board which supplies an ALC feedback voltage and a control voltage which is used to drive an "ALC" LED on the front panel so one has an instant indication if a safe ALC level is exceeded.

The front-panel metering is much the same as in the original Corsair. The meter is an "S" meter on receive and a multifunction one on transmit, which can be switched to monitor forward power, collector current, SWR, or the audio processing level. In the SSB mode the forward power indication is peak reading (PEP on SSB).

(To Be Continued)

Next month we'll continue our review with a description of the frequency readout system.

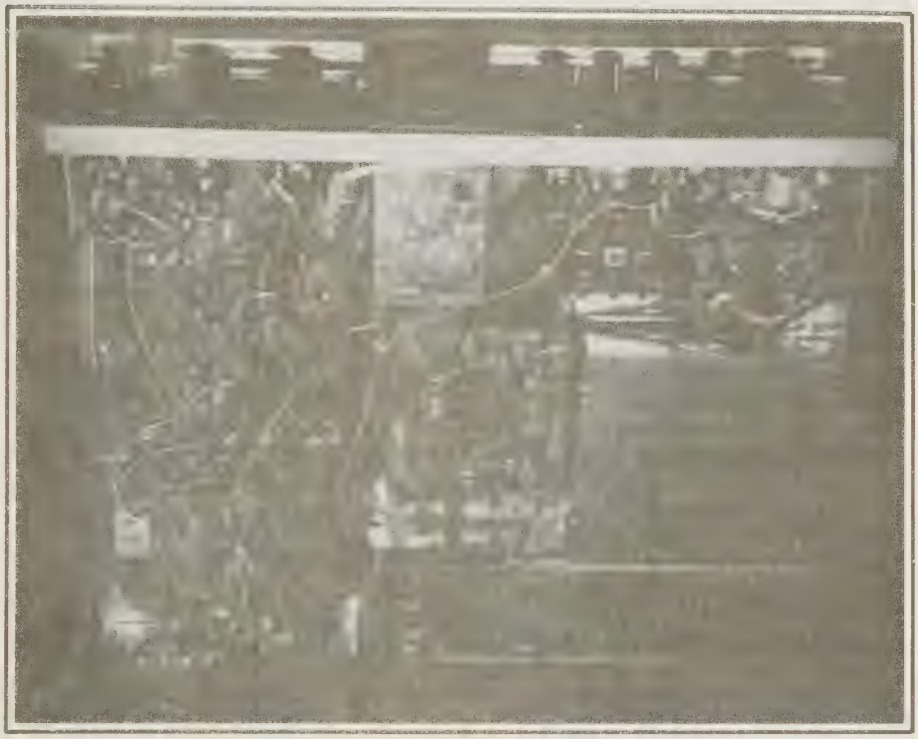
CQ REVIEWS:

The Ten-Tec Corsair II Transceiver—Part II

BY JOHN J. SCHULTZ*, W4FA/SV0DX

In reviewing a new piece of equipment, it's very hard to set guidelines, especially how much space to allow for publication. Sometimes the equipment is deceptively simple, and through use one finds much to write about and describe. In these instances the review, if run intact, would take up a majority of an issue, excluding other articles of interest. Although I don't like the practice of publishing reviews in several parts, it comes down to the only practical way of presenting all of our findings and at the same time giving readers additional amateur radio material to read and enjoy.

This month we conclude our review of Ten-Tec's Corsair II transceiver. Last month we left our discussion at the point of describing the front-panel metering. We now take up that discussion with a description of the Corsair II's frequency readout system. —K2EEK



A look inside with the bottom cover shell removed.

The frequency readout still uses 6-digit 0.3 inch LED numerals, but the color scheme has been changed with the display having five yellow readouts and a green one for hundreds of Hertz. However, behind the scenes there is much more than a cosmetic color change. The display driver circuitry has been completely changed and a logic board with a new MC68705P3 LSI circuit introduced. Fig. 5 shows the logic board diagram. Apparently, the LSI handles a variety of functions concerned with control, counting, and display, and last, but not least, it contains the iambic keyer and keyer memory functions.

Finally, to sort of "top off" an overview of the new circuitry in the Corsair II, fig. 6 shows the LPF-TR (low pass filter—transmit/receive) board. This board is the heart of QSK operation when using CW. The final amplifier output is disconnected from the low-pass filters and antenna circuit during *receive* by relay K1 to prevent signal "suck-out." Q1 indirectly controls the connection of the antenna to the receive terminals during non-transmit periods by biasing diodes D1 and D2. These PIN diodes, when not forward biased for receive, are back biased for antenna isolation on transmit by a voltage rectified by D3 to D6. The circuitry looks relatively simple, but it requires a very careful balance of switching and recovery times to achieve high-speed, clean, full QSK.

c/o CQ Magazine

Construction

During the course of trying to obtain at least a basic idea of the circuitry in the Corsair II, a fair amount of time was spent roaming around the PC boards inside the transceiver. All of the boards are very well laid out, the component locations are clearly labeled, prime quality parts are obvious, and each board is interfaced with connectors to other boards so any individual board can be removed for service purposes rather easily. The only minor point that was missed, in my opinion, was that the internal speaker did not have a cable disconnect at the speaker terminals. Therefore, when I rather quickly removed the bottom cover (which holds the internal speaker), I pulled the voice coil connections on the speaker completely apart. A new speaker was purchased and easily installed.

From a mechanical construction viewpoint the Corsair II rates very high marks. Good hardware is used throughout. There are some riveted mountings used for phone-type rear-panel connectors. But, for the connectors which are likely to receive hard usage (e.g., the SO-239 antenna connector) solid hardware with plenty of lockwashers is used. As with the original Corsair, one continues to have the feeling that the Corsair II was designed with a great deal of attention to those internal details which would augur

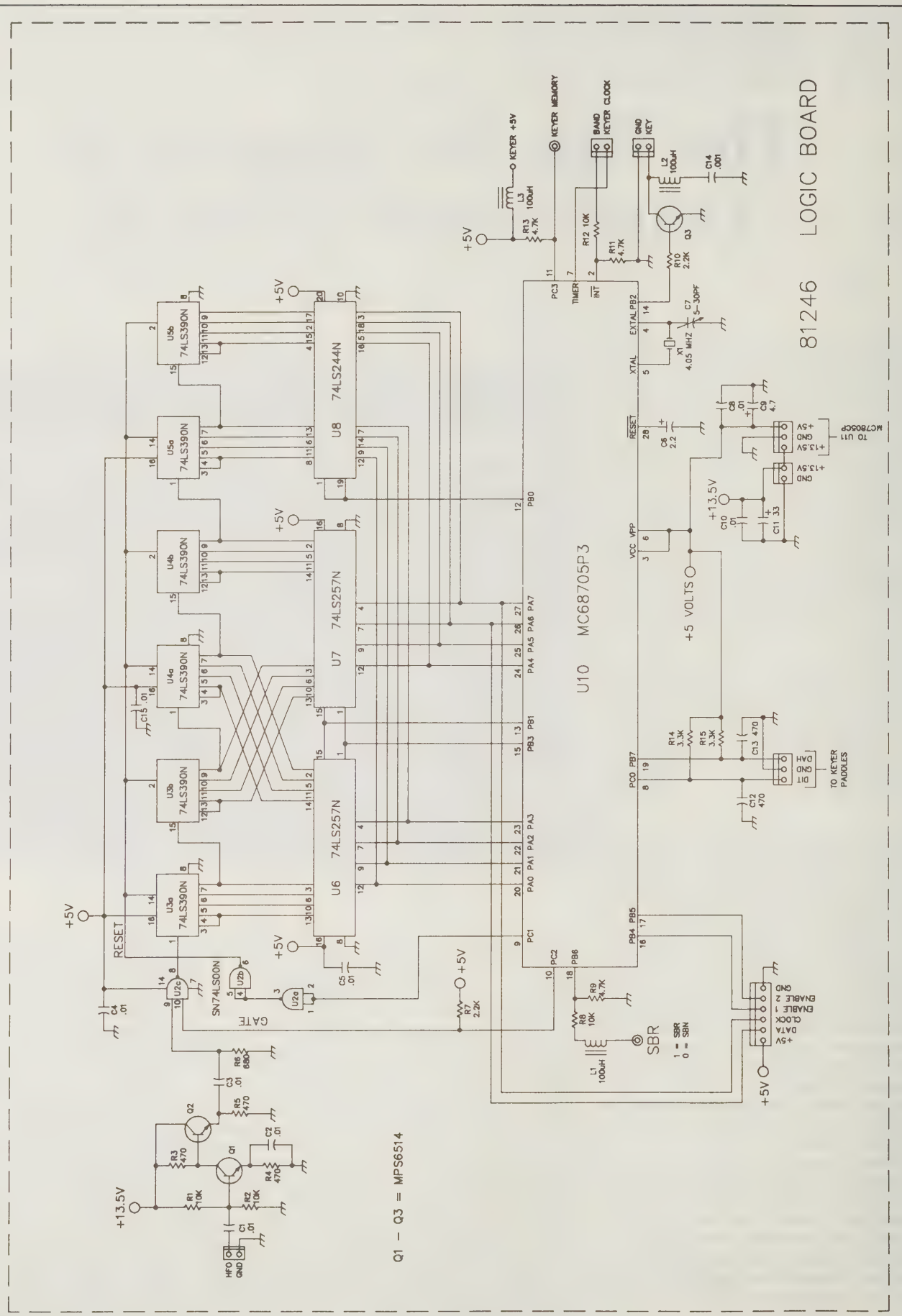


Fig. 5– The logic board. U10 also contains the keyer circuitry.

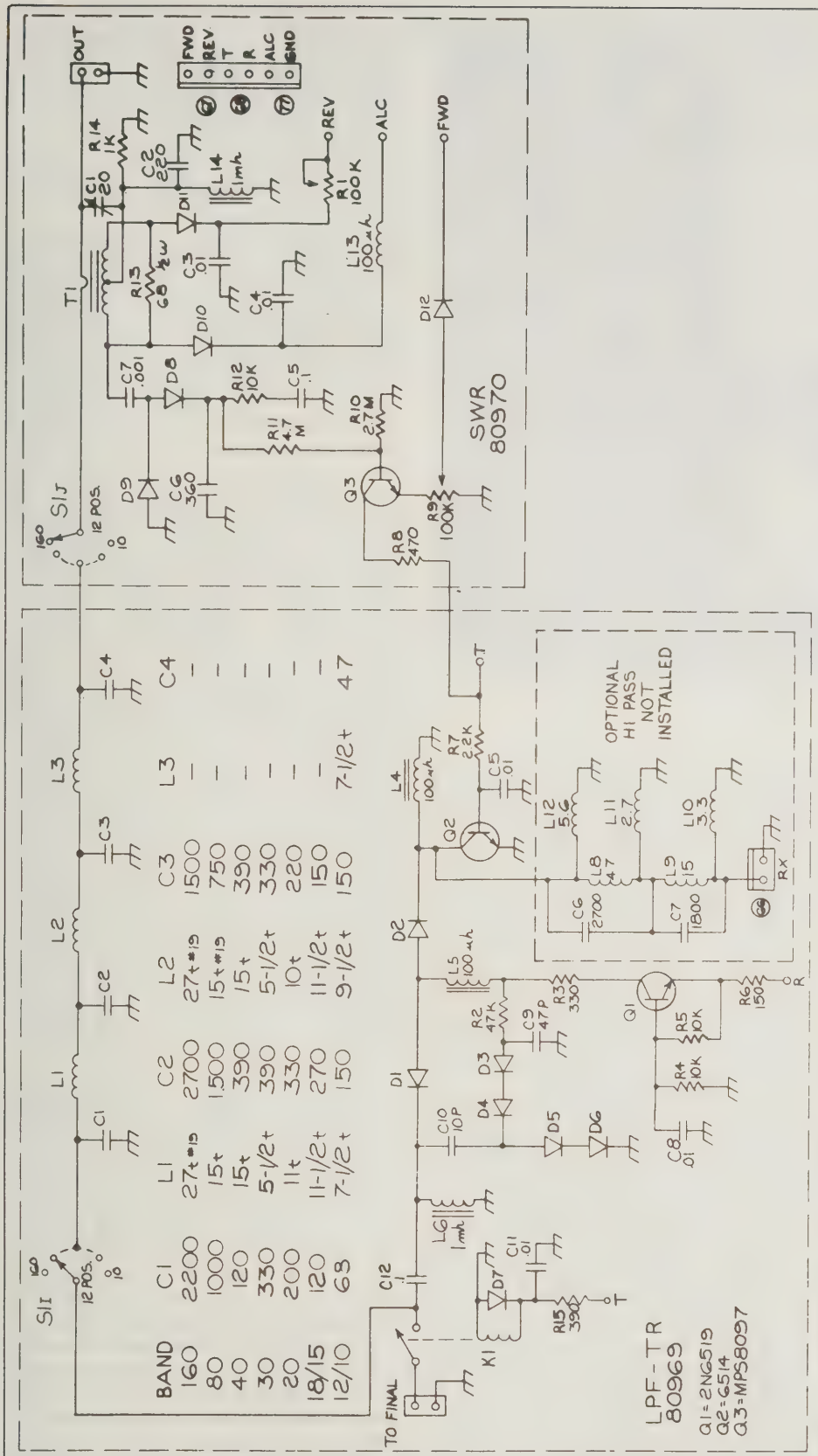


Fig. 6– The low-pass filter and transmit/ receive board which contains the antenna switching circuitry for QSK operation.

for the combination of an extremely long, normal service life, yet allow the relatively easy removal of PC boards or other components if service work is necessary.

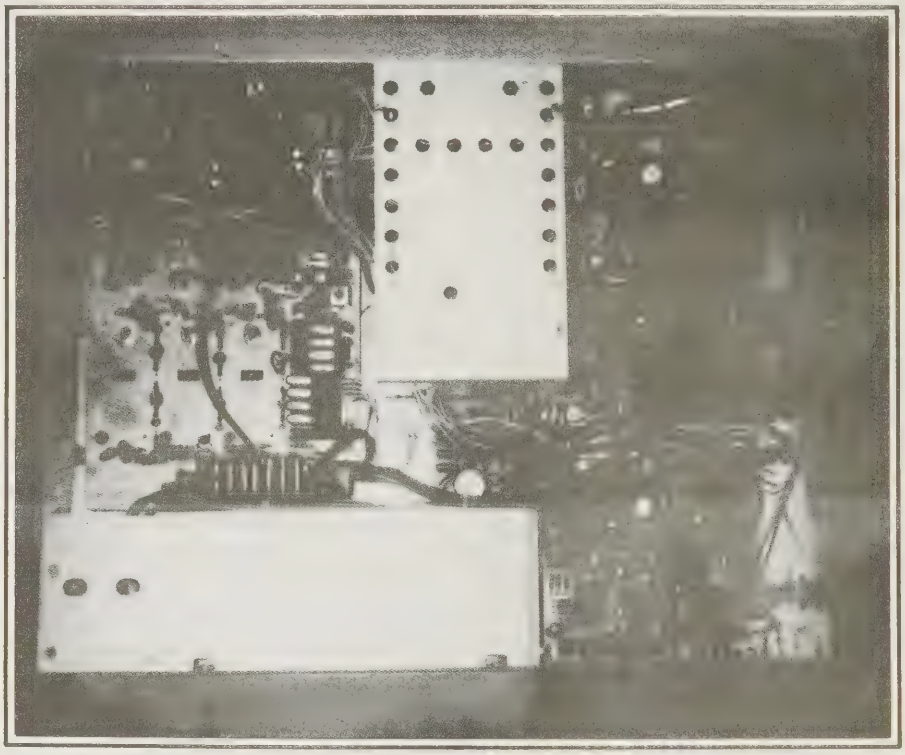
Two of the photographs show the transceiver with its top and bottom outer shell covers removed. Ten-Tec has stayed, basically, with its original design concept of distributing the transceiver's circuitry among a large number of PC boards. In fact, although all sorts of circuit boards have changed, their "head count" remains at 22. This construction approach requires a good amount of interconnection wiring among the boards, but it keeps the signal circuits better isolated, and the interaction between diverse signal paths is minimized.

One can see from the photographs that the PC boards are very neatly arranged. Some of the cable runs seem to be a bit haphazard, but in reality they are well grouped and held together by numerous cable ties. The shielding of individual boards or sections has been increased. For instance, looking at the photograph of the bottom interior one can still see the shielded PTO assembly behind the main PTO tuning knob. However, new shielding has been added to completely enclose the Oscillator/Mixer assembly (middle right) and the bottom of the power amplifier section (lower right). The actual power amplifier is in another separately shielded enclosure directly connected to the heat sink on the rear of the transceiver. Because of the added shielding, only a small portion of the bandswitch can be seen (upper right corner). All of the main RF paths for the bandpass and low-pass filters are switched by the bandswitch. No relays or diode-switching schemes are used. Diode switches are used, however, in some sections of the transceiver for in/out switching of the RF amplifier stage on receive, selection of the optional IF filters, routing of the IF signal, and various other functions.

Looking at the top interior view, one immediately spots that a new shield has been placed over the top side of the power amplifier section. The large shielded enclosure in the upper middle part of the photograph used to house the frequency counter circuitry. It still houses that type of circuitry and also the circuitry shown in fig. 5. One can see three blank areas (middle left) which are provided for mounting any of the three optional IF filters.

Bench Checks

The "specs" measured on the Corsair II proved to be better in many cases than those found on the original Corsair. Certainly, none came out worse. There are no super dramatic improvements in any given area, but the fact that so many improvements were noted "across the board" confirms again that Ten-Tec worked over the original design in every corner. Some of the measurements were so uniform it was not felt useful to tabulate them. For instance, the power output varied at most ±2 watts from 100 watts on all bands. Full power output was available for at least 30 minutes key-down without anything seeming to go astray (not using any external fan). Transmit third-order IMD products on 20 meters measured –34 dB at full output (an improvement of several dB). Unwanted sideband rejection and carrier suppression both improved to better than –63/64 dB.



A look inside with the top cover removed.

On the receive side, the dynamic range showed the most improvement, going from 90 to 96 dB (SSB bandwidth on 40 meters). The third-order intercept point was an excellent +19 dB with the RF amplifier *out* and +7 dB with it active. The receive "birdies" of significance were exactly those noted by Ten-Tec in the instruction manual: 1.838, 21.300, and 28.980 MHz. The latter can be eliminated by using the VFO overrun on the 29.0–29.5 MHz 10 meter band segment.

Operation

The Corsair II provides the same light and easy tuning "feel" as the original design with the main tuning covering about 18–20 kHz per revolution. Markings on the skirt of the knob can be used for quick but approximate QSY's, such as the typical up/down 3 or 5 kHz. Ten-Tec didn't follow my original advice to provide a deeper fingertip well on the knob. That would still be my preference. The new yellow color for the digital frequency readout is very easy on the eyes while being sufficiently bright under any ambient light condition.

Ten-Tec makes a point of the fact that the "S" meter reads the commonly accepted standard of 50 microvolts for S9. It does indeed on 20 meters. Another transceiver I was testing in a price class above that of the Corsair II required 300 microvolts to read S9.

As with the original design, the low-noise design of the transceiver creates the impression of even relatively weak signals "popping" out of a quiet background as one tunes across a band. It definitely will be pleasing to an operator who spends hours behind a transceiver searching for rare DX.

I rarely had to deactivate the RF amplifier stage (done by means of a pull-switch on the RF gain control) to avoid overload conditions even when encountering strong broadcast QRM on some bands. However, even the best designs can "cave in" under extreme conditions, so it's nice to know the switch is there. It's also nice to see that separate RF and AF gain controls are retained.

As for combating QRM, the optional filters, the standard notch and passband tuning, and the new bandpass tuning features provide many possibilities. Since none of them are on ganged controls, they are all easy to manipulate. The offset tuning (selectable ±1.5 or 4 kHz) is also extremely useful, and it can be used for either receive or transmit offset. The new bandpass filter control, although centered on 750 Hz and presumably intended for CW reception, was also very helpful on SSB reception. The passband tuning acts as a variable bandwidth feature on SSB (either with the standard 2.4 kHz or optional 1.8 kHz SSB filter) and functions very smoothly, although I would have preferred that the tuning range be spread over more of the potentiometer rotation. If one of the optional CW filters is installed, the passband tuning no longer changes the bandwidth, but the effect is produced of having a BFO control so stations close together within the narrow bandwidth of the filter can still be distinguished by their pitch. All in all, I would say the Corsair II provides very balanced features on receive for both the CW and SSB operator. For casual operating (however one defines that), the optional filters are not necessary. For serious DX or contest operating on a crowded band, one or more of the optional filters becomes a very logical investment.

On the transmit side, excellent reports were obtained on both CW and SSB, although my CW ability is really below the capabilities of the transceiver. Using either mode tune-up quite simple. The mode switch is placed in the "lock" position and the drive control advanced until the ALC LED lights. While doing this, any external accessory, such as an antenna tuner, can be adjusted. When operating CW, tune-up is then complete. When operating SSB, one has to double-check that the ALC LED only lights on voice peaks and, if not, advance or retard the drive control (now acting as a microphone gain control) accordingly. One can use the panel meter to check various parameters on transmit, but once initially set up, the ALC LED "tells it all." Once one gets used to operating the unit, one can even sense from the LED if the speech processor is correctly adjusted.

For CW operation one has all sorts of possibilities to key the unit. An external electronic keyer or straight key can be used, or one can use the internal keyer by connecting an external paddle. The internal keyer worked as smoothly as any I have ever tried. The use of the built-in keyer memory requires a simple, external switch connection to set the memory for either programming or playback. Forty characters, including pauses, can be recorded. In playback, the speed is set at that of the front-panel keyer speed control.

Full or semi break-in operation is available. I'm sure I couldn't "exercise" the Corsair II fully on QSK, but at 20 wpm plus the full break-in seemed to work perfectly. Considering that the receive recovery time is 30 ms and that a dot has a length of 30 ms at 40 wpm, the upper speed limit for full QSK must surely be at least 40 wpm. The 30 ms recovery time also means the Corsair II should be fully AMTOR compatible, although that mode was not tested. Naturally, the Corsair II has all the necessary features to operate full QSK with Ten-Tec's TITAN linear amplifier. The built-in sidetone is adjustable for volume and pitch by thumb-wheel controls reached via an opening in the bottom cover.

On SSB, consistent reports were received of full, clean modulation using Ten-Tec's Model 214 electret microphone. The speech processor deserves extremely high marks for a purely AF type. Comparison reports under medium to weak signal conditions (roughly S5 or below) indicated that the use of the pro-

cessor added about an "S" unit to the received signal. Many stations preferred that the processor be left in at all times. I couldn't find any fault with the processor—indeed it deserves great praise—but I did sort of feel that an opportunity was lost with the Corsair II to offer the user who also desires true RF-clipping-type processing a choice of processing methods. After all, an 8-pole SSB filter sits unused in the set during transmit, which would seem ideally applicable to filter a clipped SSB IF signal. I suspect the good folks at Ten-Tec can't accept the idea that *moderate* RF clipping produces better results than involved AF processing schemes.

Accessories

Besides the optional IF filters, the main accessories available are the Model 260 power supply, Model 263G remote VFO, and the Model 425 TITAN linear amplifier.

The 260 power supply is a fully regulated, overcurrent and overvoltage protected unit. It also contains a front-panel facing ceramic magnet speaker. It is a ruggedly constructed unit with a large heat sink on the rear panel for the pass transistors, and two jacks on the rear panel for accessories needing 12 VDC. A bottom-panel switch provides for 110 or 220 volt primary operation. The front-panel on/off switch is also a circuit breaker which can easily be reset if a quick overload takes place during tune-up, for instance. The 260 was used when testing the Corsair II, and it is a highly recommended unit. By the way, Ten-Tec does highly recommend that their Model 1140 circuit breaker be used in the 12 volt line to the transceiver if it is powered from a power supply other than the 260 or directly from a 12 volt battery. The breaker ensures a quick enough overcurrent response to protect the final amplifier transistors. The TITAN linear amplifier was covered in a previous review article. It interfaces, of course, fully and instantly with the Corsair II to develop a full legal-power-input station with full QSK on CW.

Owner's Manual

The manual for the Corsair II is, first of all, spiral bound. It's a small point, but it is one of the few manuals around that one can lay flat for page-by-page usage. The manual is easy to read and starts off with basic hookup information, condensed step-by-step operating instructions for those who are hell-bent to get the transceiver on the air a few minutes after hooking it up, detailed operating instructions so one can really appreciate how to use the transceiver after one calms down, and then finishes up with an alignment and service section. The latter section contains a block diagram, a main chassis wiring diagram, and schematic diagrams for each PC board to include voltage-level charts. Alignment instructions are also given for each PC board where such work is user-possible. Given the information supplied, an experienced amateur, even with only what today would be considered basic test equipment, can perform a considerable amount of troubleshooting and alignment work on the transceiver. Only the counter and logic boards would be beyond field service.

The Corsair II which was tested worked perfectly from the day "go," so I can't comment personally about any factory service work. But other amateurs with whom I have discussed Ten-Tec's service response continue to rate it as outstanding.

Summary

I think the point has been adequately made that the Corsair II is not the original Corsair with a few factory updates. It is a newly redesigned Corsair both inside and outside. The transceiver has sophisticated operating features, but is still very straightforward to operate. It makes sense that Ten-Tec has expressed an intention to continue to produce the Corsair line for those amateurs who obviously prefer its design philosophy and attention to details in execution of the design.

CQ REVIEWS:

Ten-Tec's Titan Legal-Limit Power Amplifier

BY JOHN J. SCHULTZ*, W4FA

The increase in the linear amplifier legal power limit to 1500 watts *output* has resulted in a number of new linears coming on the amateur market. However, since the hefty 1500 watt output level is far beyond what can be handled by simple linears using sweep tubes, 811's, 572B's, etc., manufacturers of the new "super" power level linears have generally turned to ceramic/metal power tubes, notably those from the Varian/Eimac company. That has unveiled a rather quiet, but extremely significant revolution in modern-day power-tube design. Ceramic/metal power tubes now can combine very high power dissipation in a physically small package and yet have good power gain, low distortion, high efficiency, and very low filament power requirements. Anyone remember the 750TH?

Anyway, the reason for this prologue is not really to reminisce, but to indirectly introduce the Ten-Tec's Titan linear. It is a full legal power linear which utilizes two of the very newest Eimac ceramic/metal power tubes and is an excellent example of modern, compact, high-power linear-amplifier design.

The Titan comes in three shipping containers—one each for the linear-amplifier compartment, the power-supply compartment (minus the power transformer), and the power transformer itself. The only assembly work one has to do is to mount the hefty power transformer (it weighs almost 45 lbs.) in the power-supply compartment. The latter procedure involves unscrewing and rescrewing some 24 screws and/or nuts and bolts both to remove and replace the cover on the power supply and to bolt down the transformer. However, no wiring is required since the transformer has plug-in wiring connections. Two cables, both about 6 feet long, interconnect the power

Photo 1. The Titan in operation next to a Corsair transceiver. It's hard to imagine a 3 kw linear almost the same size as its matching transceiver.

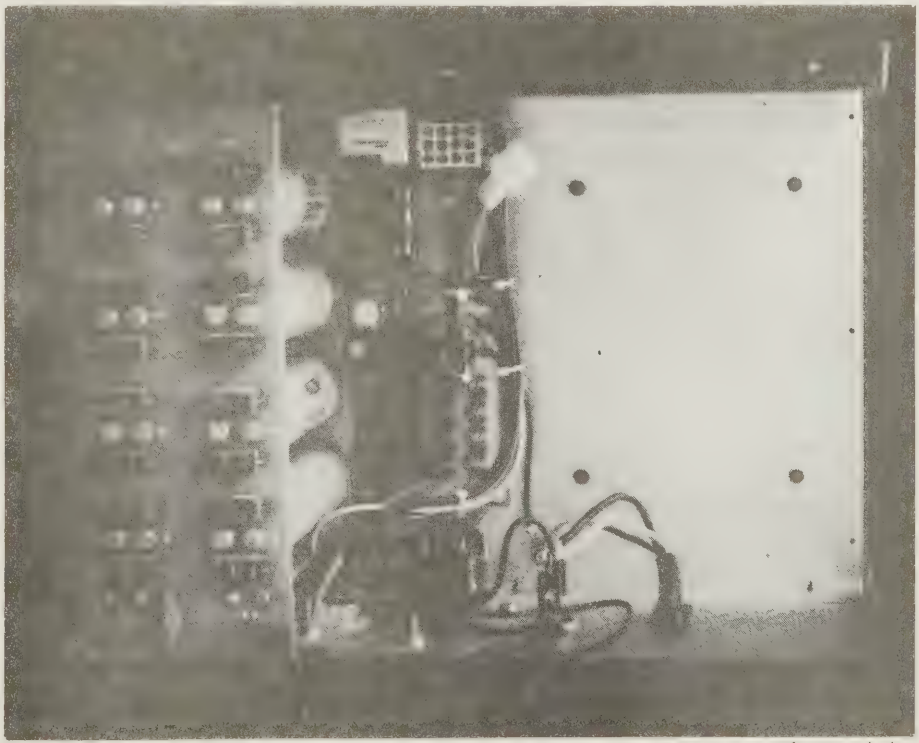


Photo 2. The inside of the power-supply enclosure before the power transformer is installed (a simple procedure).

c/o CQ Magazine

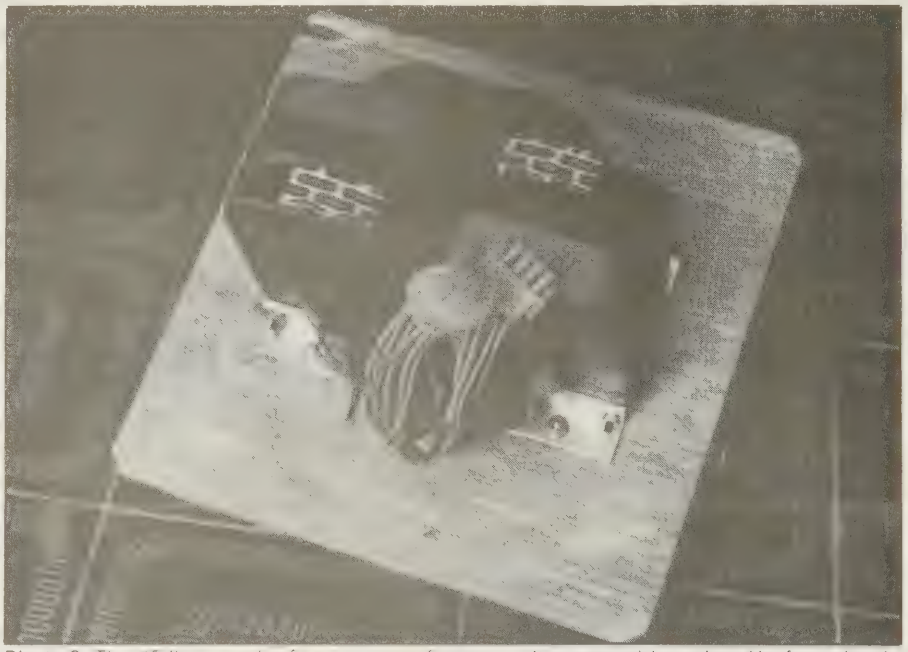


Photo 3. The 45 lbs. worth of power transformer as it comes shipped and before simple installation in the power-supply enclosure.

supply and amplifier so the latter can be conveniently located in a station setup. All operating controls and indicators, by the way, are on the amplifier so the power supply can be placed out of view. The power supply is wired for a 220 VAC line since it can draw as much as 4 kw of line power; 120 VAC operation is not recommended, but possible.

General

Table I shows the specifications for the Titan. Before going into an overview of its features, one might note the power input figures *vis-a-vis* the sizes and weights for the power supply and amplifier. The Titan packs a lot of RF power into small, relatively light-weight enclosures. The amplifier enclosure, for instance, weighs less than many transceivers. The reason this can be done is due primarily to the usage of the modern Eimac power tubes and, to a lesser degree, to a modern power transformer and compact filter capacitors in the power supply.

The Titan has a maximum SSB/CW power input of 3 kw (2 kw in continuous service) and requires less than 100 watts drive over its operating range. The latter encompasses all of the presently available bands authorized high-power operation, including 160 meters, although a 10 meter modification has to be installed to allow operation on that band. Ten-Tec has stated that it will make information available on use of the Titan on the 10, 18, and 24 MHz bands when linears are allowed on those bands. Full QSK (break-in) operation is possible at keying speeds up to at least 50 wpm. With an efficiency of 50–65%, the Titan will develop the full, legal 1500 watt output level in any mode. The input and output impedances are the standard 50 ohms. IMD products are rated at −35 dB, and harmonic rejection is rated a very respectable −50 dB.

In order to monitor various electrical parameters, the Titan uses an interesting combination of conventional metering and LED indicators. One meter is dedicated to reading plate current only. The other meter can be switched to read plate voltage, grid current, forward power, or reflected power. There are LED indicators for "overdrive," "operate," "stand by," or "wait." A 10-element LED bargraph display indicates peak power output continuously. The controls are straightforward and simple and, besides the meter switch, comprise the bandswitch, tune and load controls, and rocker switches for "on/off," "standby/operate," and "low/high" plate voltage.

SPECIFICATIONS
MODEL 425 TITAN AMPLIFIER

BAND COVERAGE: 1.8-2.0, 3.2-4.7, 6.5-8.5, 13.4-19.6, 17.6-23MHz. (Export model 425E covers 17.6-26.5 and 20.6-31.

MAXIMUM POWER INPUT: 3 KW, 2 KW CCS.

DRIVING POWER REQUIRED: 100 watts, maximum, 65 watts typical.

EFFICIENCY: 50-65%, depending on load, frequency and drive level.

INPUT AND OUTPUT IMPEDANCES: 50 ohms unbalanced, VSWR 2:1 or less.

DISTORTION: −35 dB from 1 KW PEP rf output level.

HARMONICS: −50 dB, typical.

CW BREAK-IN: High speed QSK capability when using a QSK exciter.

TUBE COMPLEMENT: Two Eimac 3CX800A7 ceramic air-cooled triodes in grounded grid.

TUBE PLATE DISSIPATION: 1600 watts.

COOLING: Ducted forced air, vertical exhaust, using centrifugal blower.

METERING: Full time plate current. Switch selected plate voltage, grid current, forward power or reflected power. Peak power indicated on a 10 element LED bar graph display.

AUTOMATIC LEVEL CONTROL: Negative-going, adjustable threshold.

STATUS INDICATORS: Overdrive, Standby, Operate, Wait.

PRIMARY POWER: 220-250 volts @ 20 amperes, maximum.

TRANSFORMER RATING: 2.0 KVA CCS.

PROTECTION: Primary line fuses. Plate current fuse. Ac and high voltage interlocks engaged when cover is removed.

FRONT PANEL CONTROLS: Power ON-OFF; Mode (Standby-Operate); HV (High-Low); Plate Tune; Loading; Band Switch; Meter Switch.

SIZE: Amplifier: 5¼" H x 15¼" W x 15" D. (13.5 x 39 x 38 cm.)
Power Supply: 8¼" H x 13⅜" W x 10¼" D. (21 x 34 x 26 cm.)

WEIGHT: Amplifier: 17 lbs. (7.7 kg.)
Power Supply: 45 lbs. (20 kg.)

Table I– Specifications of the Ten-Tec Titan.

Circuitry

The basic circuitry of the Titan is shown in fig. 1. Two 3CX800A7 tubes are used in a grounded grid circuit. The tubes are directly cathode driven, hence eliminating the need for a filament choke, and have a tuned input circuit for each band. The plate output circuit is a double section P-L configuration which has two advantages—it increases harmonic reduction compared to a simple Pi-circuit and reduces the need for very large value loading capacitance values on the lower frequency bands. On the other hand, it does raise the voltage rating required for the variable loading capacitor in the Pi-L network and that is why, as one might note from some of the photographs, the loading capacitor has almost as wide plate spacing as the plate tuning capacitor. The plate voltage can be selected to

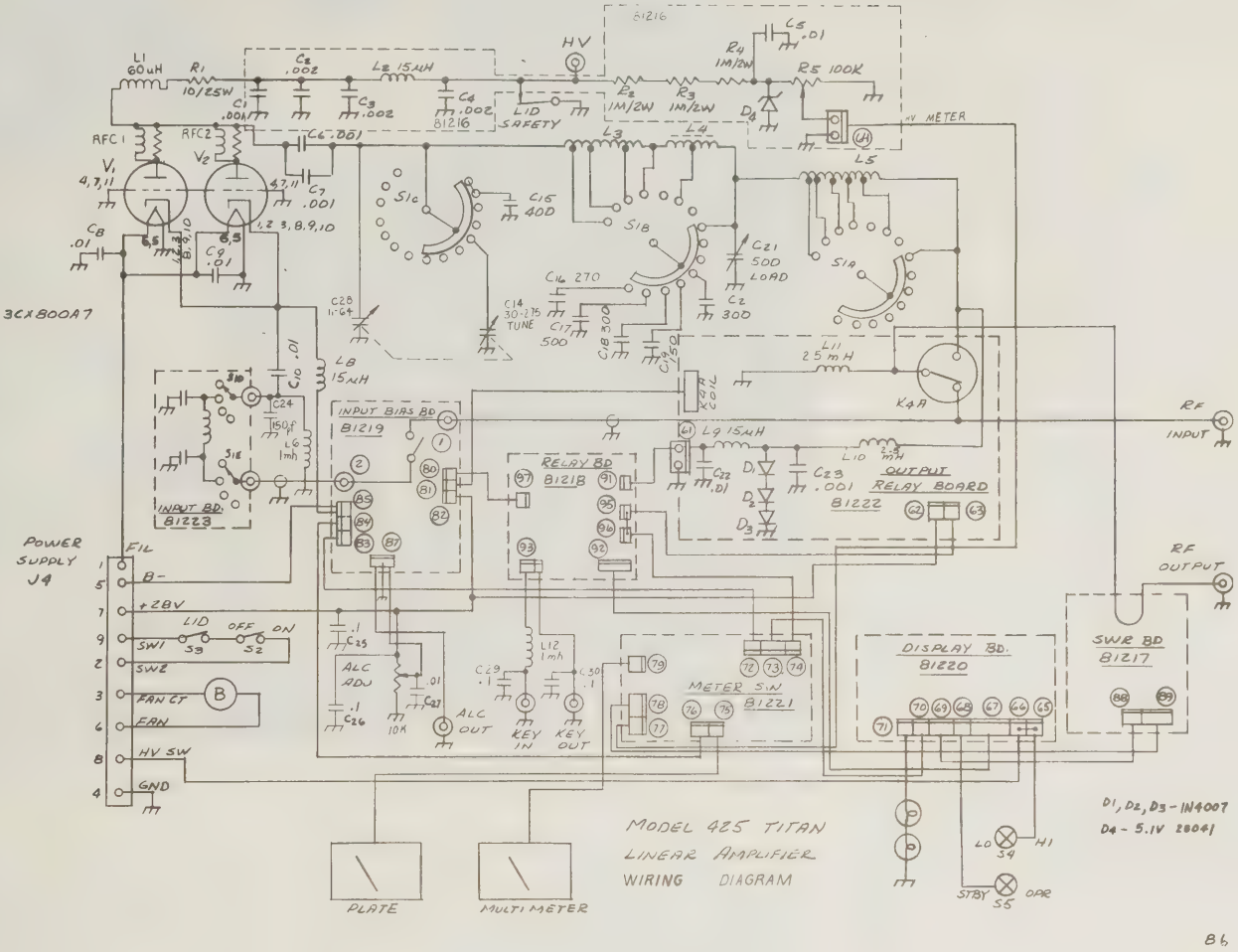


Fig. 1– Basic circuitry of the Titan.

be about 1700 volts (600 ma plate current) for 1 kw input or 2500 volts (1.2 ampere plate current) for 3 kw input. Two relays are used for antenna switchover in order to provide full QSK operation. Relay K4A is a special high-speed (2 ms switching time) vacuum relay which controls the main RF path while a smaller relay in the input bias board disconnects the tuned input circuits from the antenna line on receive so the circuits do not desensitize a transceiver's front end. The grids of the power tubes are biased with +8.5 volts during operation and with +28 volts during receive periods for cut-off. The rest of the circuitry—which provides for various control, status monitoring, and safety features—is spread out on a number of small PC boards. All of the design is really quite interesting and sophisticated, but just a few highlights concerning the ancillary circuitry will be covered.

The full QSK capability of the Titan requires that very fast transmit/receive relay switching be done while preventing the relays from "hot" switching (switching while RF energy is present). The speed with which the relays operate is largely a function of the relays' own physical and electrical characteristics. The vacuum relay used in the Titan will switch

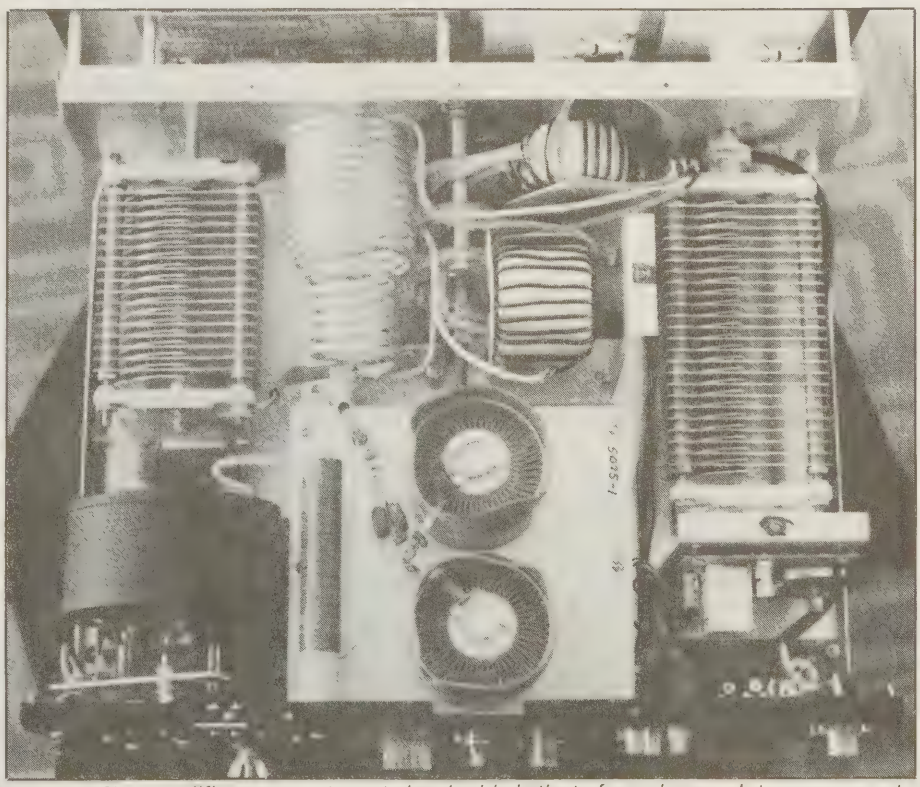


Photo 4. The amplifier compartment view inside is that of very heavy-duty components all centered around the elevated chassis for the two 3CX800A7 power tubes.

in 2 ms, and the other relays associated with the QSK feature switch in no more than 0.5 ms. The prevention of hot switching involves a chain of RF detection and control circuits. Basically, the circuitry first detects if there is drive present *before* key down. If not, the amplifier will switch to transmit and wait for excitation (keying). If drive is present, the amplifier will not switch to transmit. The circuit secondly detects if drive is present *after* the key is up. If not, the amplifier will switch to receive. If excitation is still present, the amplifier will remain in the transmit mode. The circuitry involves a number of steps in which several transistor switches are turned on or off or inhibited. However, much of the heart of the circuitry centers around the circuitry connected to the "input RF" jack shown to the left in fig. 2.

The base of Q4 receives control information from the RF detector (C4, D7, D10, etc.) and from a control line which has sensed if the key line is open or closed. If RF drive is sensed as being present, but the key line is sensed as being open, Q4 will clamp Q5 to ground, which in turn will prevent the closing of the transmit/receive relays. (K4, the vacuum relay, in fig. 1 and K3 in fig. 2). If RF drive is not sensed as being present, and the key line is closed, the amplifier will switch to transmit. When the key line is opened after transmitting a character, a second RF detector (C5, D8, D9, etc.) determines if RF drive is still present. If so, it clamps Q3, in a similar manner to which Q5 was clamped before, and the rest of the circuitry prevents the transmit/receive relays from opening. If RF drive is sensed as not being present, the transmit/receive relays are allowed to open. Incidental, but still an important part of the overall switching action, is Q1 in fig. 2, which in turn controls the zener diode D2. In the transmit mode this diode establishes the operating bias for the amplifier tubes while in the receive mode Q1 opens and +28 volts cutoff bias is applied to the tubes.

The foregoing is a very simplified ex-

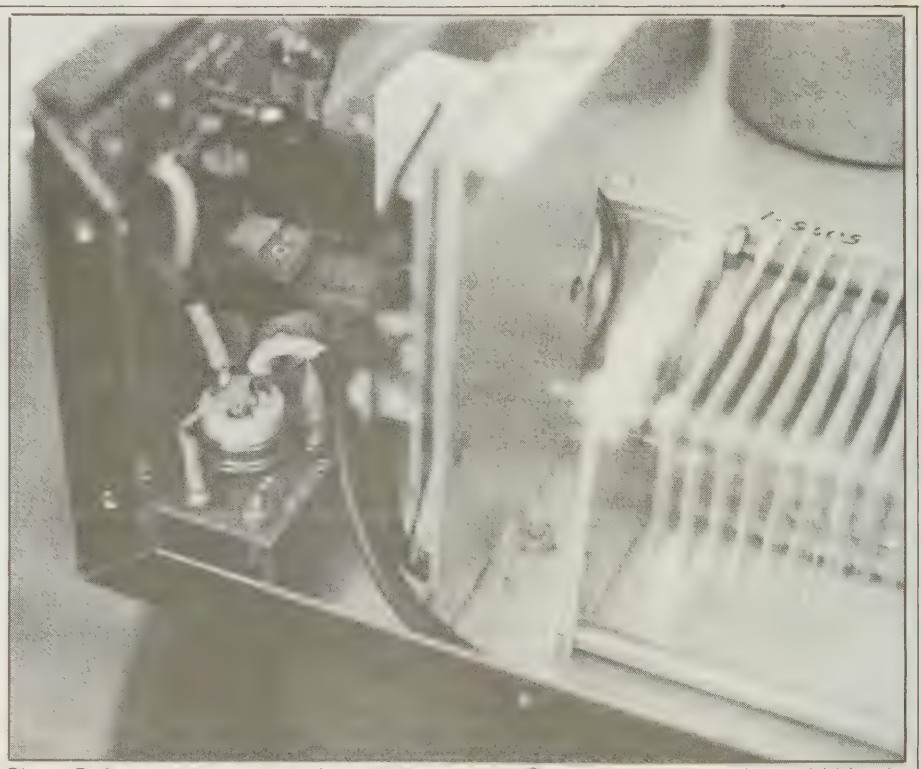


Photo 5. A special vacuum relay with less than a 2 ms closure time, almost hidden in the back of the Titan enclosure, is a main component of the full QSK system featured by the Titan.

Photo 6. Removing a bottom cover plate on the Titan shows the power-tube sockets and the low-pass tuned input circuits. Air-pressure input from the fan shown in photo 4 would be from the right.

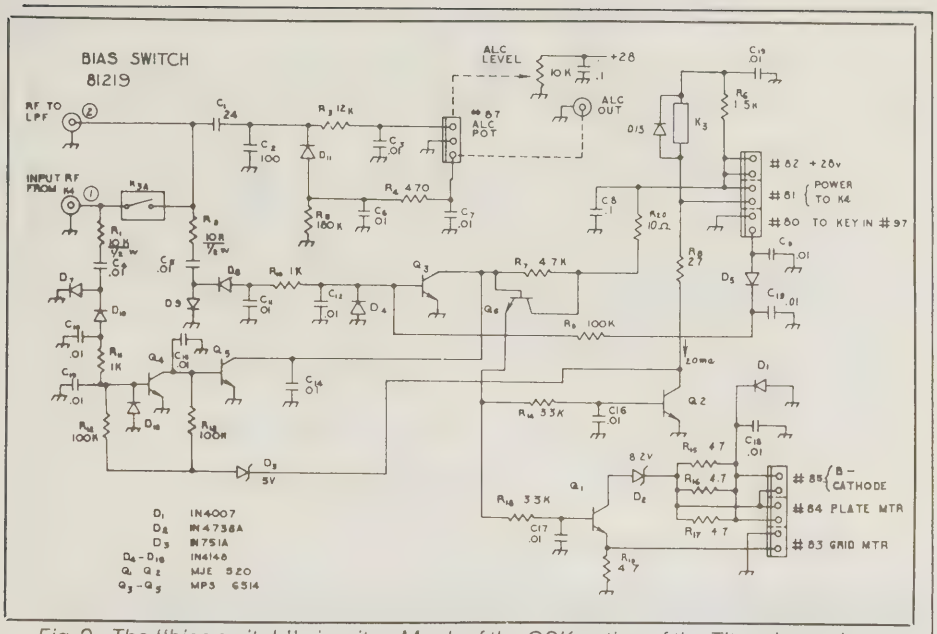


Fig. 2– The "bias switch" circuitry. Much of the QSK action of the Titan depends on circuitry on this board.

planation of some circuitry which Ten-Tec takes a page and a half in the Titan manual to explain. Nonetheless, it gives one some idea of the switching actions involved. The great trick, of course, is to arrange the switching circuitry and choose components so no unnecessary time delays are introduced by the QSK system. As far as the Titan is concerned, the limiting factor seems to be the closing time of K4 (about 2 ms). The limiting factor in a real station setup will most likely be the keying characteristics of the excitation source (Ten-Tec Triton, Delta, Omni, and Corsair transceivers match the QSK speed of the Titan).

Two other small circuits are of interest. Fig. 3 shows the SWR circuitry. It is of straightforward design, but uses a relatively small number of parts to drive a wattmeter with 2.5 kw forward and 250 watt reverse power scales. Because of the 10:1 ratio of the power scales, a quick check that the SWR is at least below 1:2 is always possible, since for that condition the overall meter deflection in the reflected position must only be less than the deflection in the forward position (once the scales on the meter have been calibrated). The outputs **FWD MTR** and **REV MTR** shown in fig. 3 go directly to the meter's forward/reverse selector switch. The outputs are not used to trip the amplifier off in case of high SWR. The output shown as **PEAK M** in fig. 3 goes to the input shown as **FWD** in fig. 4. This input drives the LED peak power bargraph (D5 to D14) via the LM3914 bargraph driver IC. Again, the circuitry is basically simple but very effective. The bargraph display has nine green segments and one red segment. R1 is calibrated such that the *red* segment, D14, lights when the peak output power sensed is 1500 watts.

Although a panel meter reads the grid current directly, an LED indicator marked

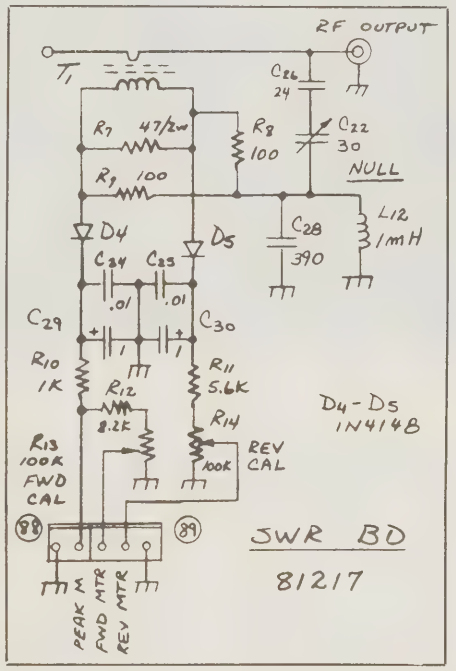


Fig. 3– The simple but effective SWR/power detection circuitry. T1 can be seen a bit next to a vacuum relay in one of the photographs. It's a simple toroid core transformer.

"overdrive" warns of excessive peak grid current. The circuitry is not shown, but basically it uses a comparator IC which senses the voltage across a 4.7 ohm resistor in the grid bias return line to ground. The comparator is biased to drive the LED when the grid current reaches 120 ma.

The diagram of the power supply is shown in fig. 5. The high voltage supply utilizes a Hipersil core transformer rated at 1.8 KVA CCS. The primary has two separate 120 volt windings but it is prewired only for the standard U.S. 117-neutral-117 system or overseas 230 volt operation.

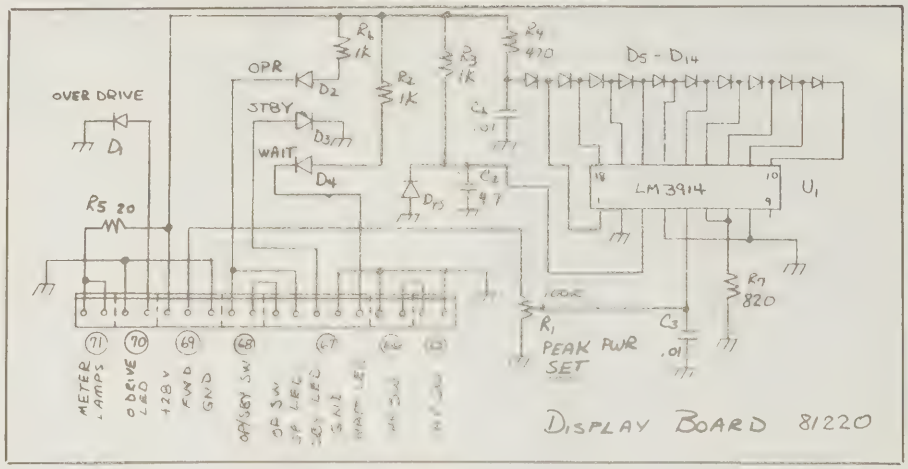


Fig. 4– The circuitry for the peak-reading power bargraph.

Photo 7. The rear panel of the Titan is simple and functional, with SO-239 RF input/output connectors.

The high-voltage winding is connected to a full-wave bridge rectifier, not a voltage doubler, and the series bank of 400 mF capacitors provide for an effective 50 mF of output filtering. A low-voltage tap on the high-voltage winding is relay selected, and separate 20 volt and 13.5 volt windings provide power for the control circuitry and relays and the amplifier tube filaments. There is an interlock switch and crowbar shorting switch, as on the amplifier unit itself. The former acts to disable the turn-on of AC power to the supply when its cover is removed, while the latter just plain shorts the high voltage to ground both to discharge the capacitor bank and to act as a double protection in case the interlock circuitry fails. In case of a "crowbar" operation, D13 and R1 in fig. 1 limit the surge current so no power supply components are damaged.

Construction

The photographs tell most of the story about the construction of the Titan.

The power supply is housed in a separate enclosure and has no controls. The filter capacitor bank is associated with one main PC board, while the rectifier components are located on another PC board. The construction is very neat and standard, and heavy-duty components are used throughout.

Looking inside the amplifier compartment, one can see the general layout used with the tuning and loading capacitors towards the outside edges, the coils for the Pi-L output network in the center, and the two power tubes on a separate, raised chassis assembly. The latter is pressurized by a squirrel-cage fan which forces air into the side of the chassis enclosure and which exhausts upward through the tube anode fins. Insulated chimneys around the anode of each tube channel the air flow. The air intake is from the sides, not the bottom, of the amplifier enclosure. A small PC board located near the output coaxial connector contains the vacuum relay for antenna transfer. Looking at the bottom of the amplifier, with the cover plate of the tube compartment removed, one can see the tuned input circuitry. The back panel of the amplifier contains regular SO-239 connectors for RF in/out, phono-type connectors for key line functions, and a special high-voltage power-supply connector. The construction appears to be very sturdy, and there is a generous use of machine screws where some manufacturers might have used rivet fastenings, plenty of teflon insulation around coil tap wires, etc. The bandswitch is a heavy-duty, ceramic insulated type.

PTT and CW operation are about as simple as can be imagined and are shown in

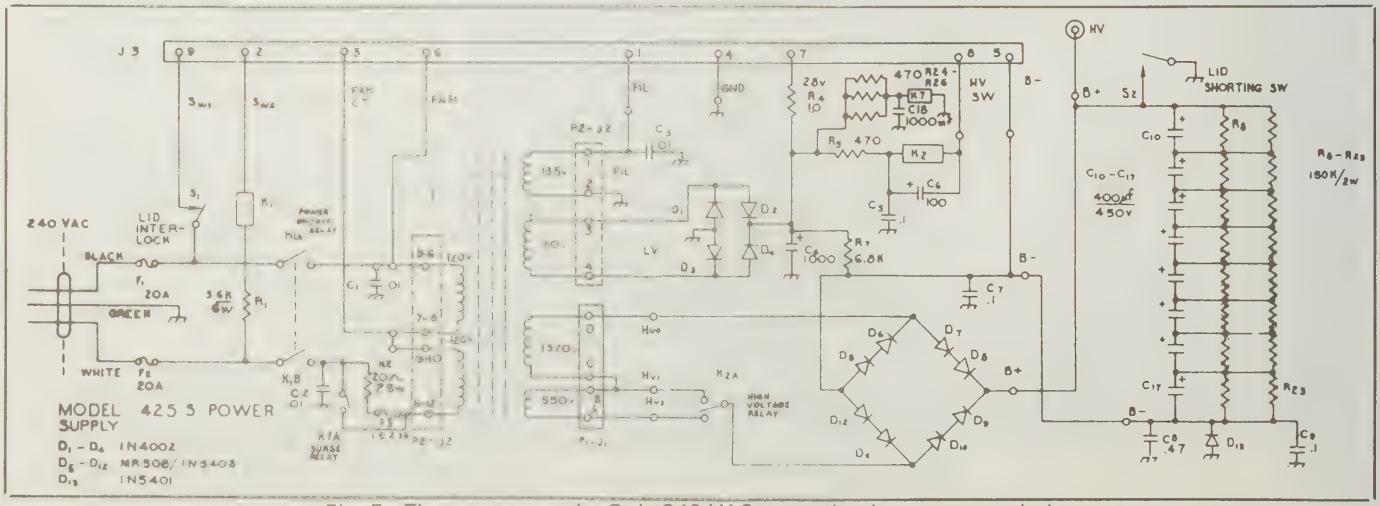


Fig. 5– The power supply. Only 240 VAC operation is recommended.

fig. 6. The dotted line showing ALC interconnections is **not** necessary in the case of solid state transceivers. The ALC interconnection may only be necessary with tube-type transceivers. In this case the Titan is designed to supply a negative-going control voltage to the ALC **input** on such a transceiver. For QSK operation, the interconnection scheme of fig. 7 is used. In this mode the amplifier itself, not the exciter, is actually keyed. The amplifier QSK system keys the exciter after ensuring that the amplifier's relays cannot be hot switched. The Titan manual supplies full information on the interconnections, but it is just interesting to note how simple it is to accomplish.

Tuning and Operation

Tuning of the Titan is greatly facilitated by the vernier drives employed on the loading and tuning controls and the combination of the analog meters and the LED bargraph power display. One doesn't go through the usual "tune for plate current dip and adjust the load control" routine. With the high-voltage switch in the low position, drive is applied, and the load and tune controls alternately adjusted so the power output peaks as viewed either on the analog meter (set to forward power) or on the LED display. After a bit of practice it becomes extremely easy to tune the amplifier just watching the LED display, because it is so responsive to changes in the control settings. In fact, I would rate the Titan as the easiest tube-type linear to tune of all the manually tunable linears available.

One can operate the amplifier in the low power mode (750 watts output) continuously (the maximum time tested was 30 minutes) for RTTY/SSTV or switch the high-voltage switch to high, repeak the controls, and operate any mode in intermittent service at 1500 watts peak output. The amplifier was operated many hours at a time in SSB and casual CW at its maximum rated power output level, and there never was any sign of overheating. The last, red-colored segment on the LED bargraph display lights when one just reaches 1.5 kw output and is a very handy indicator. The same is true of the handy red LED indicator for "overdrive." One doesn't always remember to check the grid current when making a quick QSY or band change, and the LED gives a very quick warning in case of overdrive. As Ten-Tec emphasizes, if any operating fault is likely to be responsible for destruction of the power tubes, it will be excessive grid dissipation, although avoidance is easy by proper drive and loading adjustments.

The power output versus drive requirement for the Titan was found to be remarkably uniform over the 160–15 meter bands with only 60–70 watts for drive required for 1.5 kw output. The input SWR never exceeded 1:1.6. The analog meter wattmeter checked to be very closely calibrated. The LED bargraph peak wattmeter was a bit generous around the 500 watt output level, indicating more like 600 watts, but then checked out fine again at the 1.0 and 1.5 kw levels. The IMD products measured about −37 dB from 1.0 kw peak at 14 MHz. The harmonic output was not completely measured, but the claimed value of −50 dB appeared to be, if anything, conservative. As is true with almost any tube-type linear, the Titan is reasonably tolerant of small load SWR variations. It would work perfectly into a slightly changing antenna load at full power (e.g., SWR changing from 1:1.0 to 1:1.7 or so) under conditions where a solid state, high-power linear would shut down. The forced-air cooling system is very good but not perfect. There is some slight mechanical vibration to be heard besides the sound of pure rushing air. But, I do admit to being somewhat of a nit-picker on that sort of thing. I really think the blower motor should be separated from the amplifier enclosure, but that would necessitate another unbilical cord coming out of the amplifier, which most amateurs would not accept. In any case, the blower noise from the Titan is not objectionable for any sort of normal station operation including the use of high audio gain speech processors on SSB.

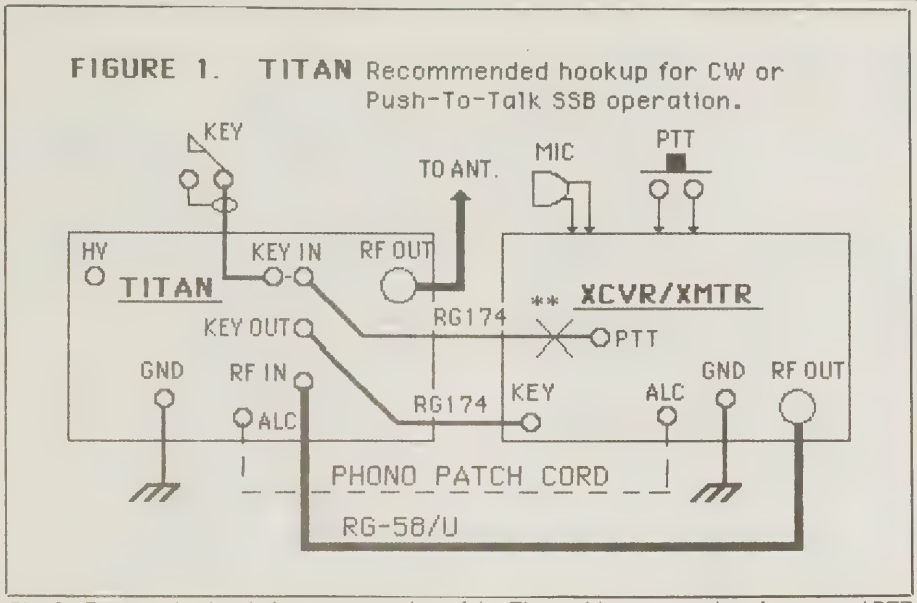


Fig. 6– Extremely simple interconnection of the Titan with a transceiver for normal PTT SSB/CW operation. The ALC connection is not required with solid state transceivers.

On-the-Air Results

When actually using an amplifier like the Titan, one does have to realize that one is dealing with **real** RF power. In the

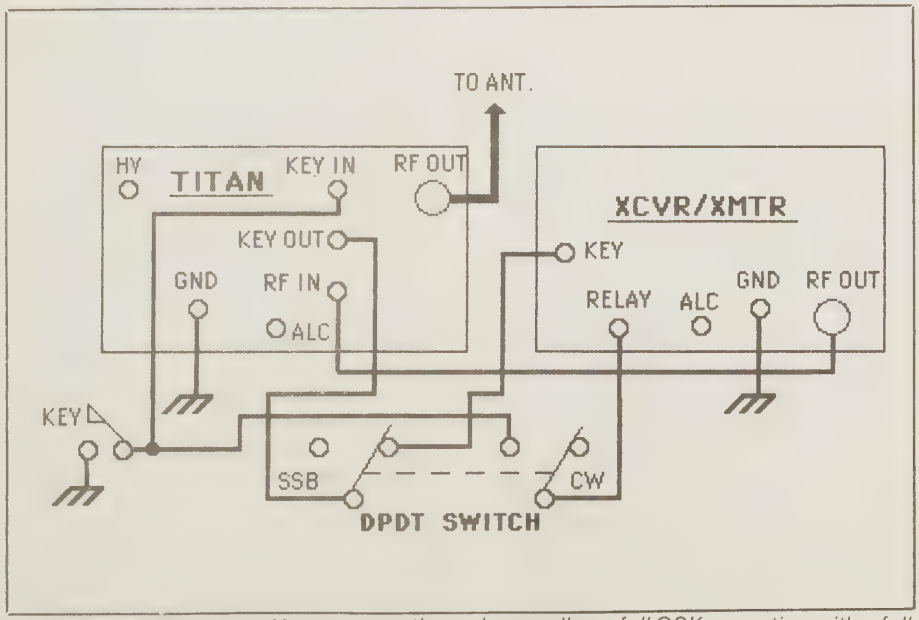


Fig. 7– A slightly changed interconnection scheme allows full QSK operation with a full QSK transceiver.

course of testing and using the Titan, the oil was heated and bubbled out of a dummy load rated at a nominal 1 kw, and a balun rated to handle 1 kw was ruined. Also, one end of a 40 meter dipole was allowed to come too close to a concrete roof surface and RF burned a hole into the concrete. So, one does have to have an antenna system that complements the power level of the Titan if one is going to operate the linear at full power! If one does have such a complementary system, the on-the-air results can be most gratifying. Compliments like a "beautifully clean" signal and signal reports of S9 + 20 dB or even S9 + 30 dB were not uncommon. Stations could be worked through pile-ups under conditions that otherwise would have been hopeless. Of course, brute RF power is one thing, but real RF power that also delivers a clean signal is something else again.

The Titan delivers both a powerful and clean on-the-air signal to judge by all the reports received, and the reports, of course, confirm the various measurements made on the Titan. The full QSK capability of the Titan was not tested. It was used up to about 20 wpm QSK, and stations reported clean keying while received CW was not truncated in any way. Considering Ten-Tec's devotion to producing properly performing full QSK equipment, there is no reason to believe that the Titan could not operate QSK up to 50 wpm as specified.

The Titan is the sort of amplifier that one gets used to using and tends to leave on even when full power is not required. The latter is, of course, quite poor amateur radio practice, but the almost inevitable result of using a linear which one feels confident will loaf along for hour after hour at its full rated power.

Manuals and Warranty

The manual supplied with the Titan is very complete. It contains a full description of how to interconnect the amplifier, how to tune and use the amplifier, detailed discussions of circuit theory (particularly pertaining to the metering and QSK circuits), and complete circuit diagrams. A chart gives approximate control settings for each band. A particularly detailed "Maintenance and Troubleshooting" section goes through some 21 detailed symptoms of malfunction and, if encountered, what to do about it. It's hard to imagine that any user would encounter a problem that is not covered. The Titan comes complete with all the necessary interconnecting cables appropriate to most transceivers and even, as a nice touch, extra fuses and a set of hex wrenches so one can retighten the front-panel control knobs (presumably after a few years of vigorous use).

Ten-Tec provides a basic one-year warranty for the Titan which includes workmanship and material except for the power tubes. The latter are warranted directly by Eimac/Varian for 3,000 hours of filament "on" time with a prorated adjustment, in case of failure, from 300 to 3,000 hours. Ten-Tec supplies Eimac warranty forms for the tubes and offers to assist in any claim. It should be noted that the 3,000 hour warranty means that even if the amplifier is used for several hours of operation each day, the tubes are covered for almost three years of operation.

Summary

The Ten-Tec Titan is certainly not an inexpensive piece of equipment (amateur net $2685.00). However, it is good, honest value for the money if one really desires a full-featured, legal power amplifier of conservative design that should provide reliable service for a number of years with the guarantee that if something should go wrong, Ten-Tec is available to take care of the problem. The latter, by the way, is not just an empty suggestion. Ten-Tec's service and information people are readily available, very responsive, and quite knowledgeable. That has certainly been my personal experience over the past few years every time I have had contact with them. CQ

Conducted By Mark Wilson, AA2Z
Senior Assistant Technical Editor

Ten-Tec Model 585 Paragon 160-10 Meter Transceiver

Reviewed by Mark Wilson, AA2Z

"When are you going to review the Paragon?" We often are asked about upcoming reviews, but no piece of equipment in recent history sparked as many inquiries as Ten-Tec's latest 160- to 10-meter transceiver. Although the previous top-of-the-line Ten-Tec (the Corsair II) is a fine performer, the Paragon makes the leap from VFO to frequency-synthesizer technology. It's the first Ten-Tec transceiver with memories, scanning features, keypad frequency entry and a general-coverage receiver. In addition, the Paragon offers AM, FM and FSK operation in addition to the usual SSB and CW, selectable IF filters, passband tuning, notch filter, audio filter, selectable AGC, QSK, clock/calendar and much more.

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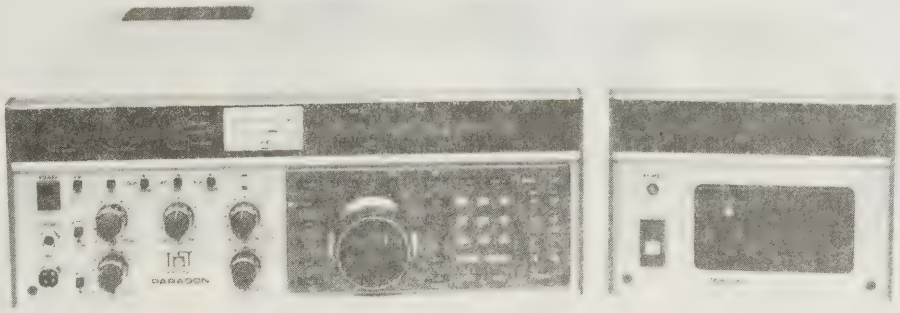

Frequency Control

The Paragon features a microprocessor-controlled, synthesizer-based VFO system. All the bells and whistles are here, including 62 memories that store information on frequency, mode, VFO selection and filter bandwidth. An interesting twist on the memory feature is the TAG function. You can label each memory with a 7-digit alphanumeric "tag" at the right-hand side of the main display. The tag can be any combination of letters and numbers, and this feature is handy for remembering what you've stored in memory. For example, I used the tag AUSTRLA for Radio Australia on 9580 kHz. Another novel feature is a front-panel switch to turn the last (10-Hz) digit on the frequency display on and off.

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Receiver

The Paragon's receiver is a multiple-conversion design with IFs at 75, 9 and 6.3 MHz. (For FM, the third IF is 455 kHz.) Signals enter the receiver through switched low-pass filters (also used on transmit) and high-pass filters. The front-end RF amplifier consists of four paralleled JFETs (J310s) in a broadband circuit. (The RF amplifier is not used below 1.6 MHz.) The first receive mixer is a singly balanced design using two more J310s. There is some crystal filtering at each IF. The 75-MHz IF has a 2-pole crystal filter; the 9-MHz IF features a pair of 8-pole crystal filters with bandwidths of 6.0 kHz for AM operation and 2.4 kHz for SSB and CW operation. Passband tuning and additional crystal filtering occur at the 6.3-MHz IF. The 6.3-MHz crystal filters have bandwidths of 2.4 kHz, 1.8 kHz, 500 Hz and 250 Hz and are selected by front-panel switches. Only the 2.4-kHz third-IF filter is standard; the others are available as options.

During ARRL lab testing, the Paragon's receiver turned in some impressive numbers. Blocking dynamic range, at about 136 dB, is fantastic. In this receiver, the limiting factor when listening to very weak signals adjacent to very strong signals is receiver phase noise, not dynamic range. Phase noise is very audible at the onset of receiver blocking. (Blocking signal levels were in the 0 to +5 dBm range—much higher than you would expect to find at your antenna terminals under normal circumstances.) Sensitivity is more than adequate, and the two-tone, third-order IMD dynamic range is excellent as well.

Mode selection is accomplished with a series of momentary-contact pushbuttons arranged vertically to the left of the main tuning knob. Choices are CW, USB, LSB, AM and FM. FSK is selected by pressing the SHIFT and CW keys.

Receiver bandwidth selection is handled by a horizontal row of pushbuttons above the main tuning knob. Choices are 6.0, 2.4, 1.8, 0.5 and 0.25 kHz. (The last three work only if the optional third-IF filters are installed.) Filter selection is independent of mode (except for FM). This is a great feature. For example, if you operate AFSK RTTY using the LSB mode, you can switch in any of the narrow filters to eliminate adjacent-channel interference. Also, there are times when a narrow CW filter is a hindrance, rather than a help. It's nice having a couple of wider filters available.

The Paragon has several QRM-fighting controls. The most useful of these is passband tuning, which allows you to shift the passband response to effectively reduce interference from nearby signals. Less effective are the BP/FADE audio filter controls. Perhaps *subtle* best describes the effects of these two controls. Notch filter depth is about 40 dB; this control is helpful at times, although the notch is sharp and adjustment is critical.

The Paragon's variable-pulse-width noise blanker works great on Soviet over-the-horizon radar ("woodpecker") interference, although its use noticeably degrades the receiver's strong-signal-handling performance—an effect common with noise blankers. The noise blanker didn't do much for my power-line noise, though.

Pressing the front-panel attenuator switch substitutes a 10-dB pad for the front-end RF amplifier. The net effect is that signal levels

Table 1

Ten-Tec Model 585 Paragon 160-10 Meter Transceiver, Serial no. 084

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency coverage: Receiver, 100 kHz to 29.9999 MHz; transmitter, 160-10 meter ham bands.	As specified, except transmitter coverage extends ≈10 kHz above each amateur band.
Modes of operation: USB, LSB, CW, AM, RTTY (FSK or AFSK), FM (optional).	As specified.
Frequency display: 7-digit blue fluorescent.	
Frequency resolution: 10 Hz.	As specified.
Power requirement: 13.8 V dc at approx 1.5 A on receive and 20 A on transmit.	13.8 V dc at 17 A at 110 W output.
Transmitter	*Transmitter Dynamic Testing*
Transmitter output power: 25 to 100 W adjustable. 100% duty cycle for 20 min; continuous with auxiliary air cooling.	Typically 110 W max, 16 W min; power output varied slightly from band to band.
Spurious signal and harmonic suppression: Greater than 45 dB below peak power output.	See Fig 1.
Third-order intermodulation distortion products: Not specified.	See Fig 2.
CW keying waveform: Not specified.	See Fig 3.
Transmit-receive turnaround time (PTT release to 90% audio output with an S9 signal): Not specified.	35 ms.
Receiver	*Receiver Dynamic Testing*
Receiver sensitivity SSB, CW and RTTY: (2.4 kHz bandwidth) 0.5 μV for 10 dB S/N from 0.1-1.6 MHz; 0.15 μV for 10 dB S/N from 1.6-29.999 MHz.	Minimum discernible signal (noise floor), with 500-Hz filter: 1.0 MHz: −117.0 dBm 3.5 MHz: −139.5 dBm 14 MHz: −137.0 dBm
AM: (6.0 kHz bandwidth) 3.5 μV for 10 dB S/N from 0.1-1.6 MHz; 1.0 μV for 10 dB S/N from 1.6-29.999 MHz.	1.0 MHz: 4.2 μV 3.5 MHz: 0.27 μV 14 MHz: 0.34 μV (Test signal 30% modulated with a 1-kHz tone.)
FM: (15 kHz bandwidth) 1.0 μV for 12 dB SINAD from 0.1-1.6 MHz; 0.3 μV for 12 dB SINAD from 1.6-29.999 MHz.	Not tested; FM option not installed.
Receiver dynamic range: 100 dB typical; third-order intercept point +18 dBm.	Blocking dynamic range (dB)†: 3.5 MHz, 136.5 14 MHz, 136 Two-tone, third-order intermodulation distortion dynamic range (dB)†: 3.5 MHz, 101.5 14 MHz, 101.0 Third-order input intercept (dBm): 3.5 MHz, 12.75 14 MHz, 14.5
S-meter sensitivity (μV for S9 reading): 50.	88 at 1.9 MHz; 44 at 14 MHz; 70 at 28 MHz.
Squelch sensitivity: AM, CW, SSB, FSK (1.6-29.999 MHz), less than 1 μV. FM (1.6-29.999 MHz), less than 0.4 μV.	SSB/CW, 0.6 μV min; FM not tested
Notch filter: 50 dB notch typical.	Max notch 40 dB.
Receiver audio output: 1.5 W at 8 ohms with less than 2% total harmonic distortion (THD).	2.3 W at 2% THD
Color: Gray.	
Size (height, width, depth): 5.75 × 14.75 × 17 in.	
Weight: 16 lb (not including power supply)	

† Tone spacing was the ARRL Lab standard of 20 kHz for blocking dynamic range test and two-tone, third-order IMD dynamic range test.

are reduced about 20 dB. (The net reduction is 10 dB below 1.6 MHz because the RF amplifier is not used there.)

The front-panel PHONES jack is designed for 4- to 16-ohm headphones with a standard (monaural) ¼-inch jack. If you use stereo headphones, you'll need to rewire the plug or use an adapter.

A welcome surprise is the Paragon's excellent AGC. Its action is smooth, and there are no noticeable pops. (Anyone who has owned a Ten-Tec OMNI, as I have, will notice the improvement immediately.) Best of all, the AGC slope allows loud signals to sound louder than weak signals, and this makes it easier to pull call signs out of a pileup. AGC release times are about 0.2 second with the switch in the FAST position and 2 seconds in the SLOW position. The manual details a modification to increase the SLOW release time by 1 second, but I didn't make this modification. The original SLOW release time is just about right for casual operation.

Transmitter

The front-panel DRIVE control varies power output from about 15 W to 110 W, with slight variations from band to band. Ten-Tec rates the transmitter at 100% duty cycle for up to 20 minutes with no additional cooling. The review unit passed a 20-minute key-down test with flying colors. As Fig 1 shows, the transmitter low-pass filters do their job well. The spectral output of this unit is exceptionally clean on all bands. The two-tone IMD products (Fig 2) are acceptable. The CW keying waveform (Fig 3) is well shaped, and the on-air signal sounds good. Rise and fall times are about 4 ms. If you want harder or softer keying, the manual shows how to set the rise and fall times in the range of 1-5 ms.

The Paragon's full-break-in CW (QSK) feature gets an A+. It works well, even at speeds of 40 WPM and higher. With some radios, the transmitted characters are noticeably truncated in the full-break-in mode; you have to adjust your keyer weighting to get an acceptable-sounding signal at higher speeds. Not so with the Paragon. I spent a lot of time monitoring the Paragon's transmitted signal with a second receiver in my shack; the full-break-in signal sounded great at all the keying speeds I tried from 10 to 50 WPM. I made no adjustments to the keyer weighting control.

The CW offset is factory aligned at 750 Hz. Some operators prefer lower offsets, on the order of 300-400 Hz. According to Ten-Tec, you can retune the BFO for a lower offset; I did not try this. Rear-panel controls are provided for adjustment of sidetone pitch and level.

On SSB, I got a number of good audio reports, even with the speech processor on. The rear-panel MONITOR LEVEL permits listening to the Paragon's transmitted audio in your headphones. The monitor is useful for setting up the speech processor. I adjusted the speech processor while listening with a second receiver. The processor adds punch, but its adjustment range is narrow.

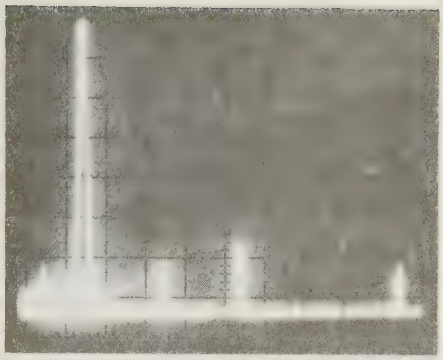


Fig 1—Worst-case spectral display of the Ten-Tec Paragon. Horizontal divisions are each 2 MHz; vertical divisions are each 10 dB. Output power is approximately 105 W at 3.5 MHz. All harmonics and spurious emissions are at least 56 dB below peak fundamental output. The Paragon complies with current FCC specifications for spectral purity.

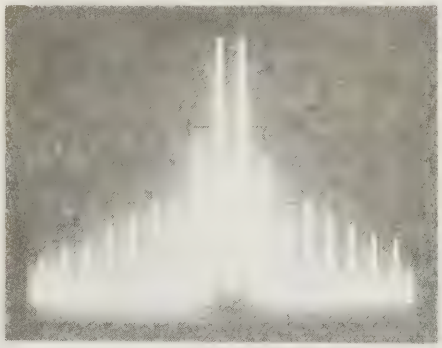


Fig 2—Spectral display of the Ten-Tec Paragon during two-tone intermodulation distortion (IMD) testing. Third-order products are approximately 33 dB below PEP output, and fifth-order products are approximately 49 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 2 kHz. The transceiver was being operated at 100 W PEP output on 3.8 MHz.

Fig 3—CW keying waveform for the Ten-Tec Paragon. The lower trace is the RF envelope; the upper trace is the actual key closure. Each horizontal division is 5 ms.

This is good; the signal is intelligible even with the processor and mic gain controls turned way up.

On SSB, you have the choice of PTT or VOX operation. The choice is just that—the microphone PTT switch has no effect when VOX is selected. I was disappointed that the VOX controls are on the Paragon's rear panel. I tend to adjust the VOX delay control quite often, and it's not convenient to get at.

Phase-Noise Measurements

With this review, we introduce transmitter phase-noise testing as part of the standard Product Review testing. March and April 1988 *QST* carry a two-part article describing phase noise, along with a complete discussion of ARRL laboratory phase-noise measurements.[1] The March/April article also shows results of ARRL lab testing of the phase-noise characteristics of other popular HF transceivers for comparison. Fig 4 shows two spectral photographs of the Paragon transmitter during phase-noise testing. This photograph was taken with the latest version (as of February 1988) of Ten-Tec's PLL board.

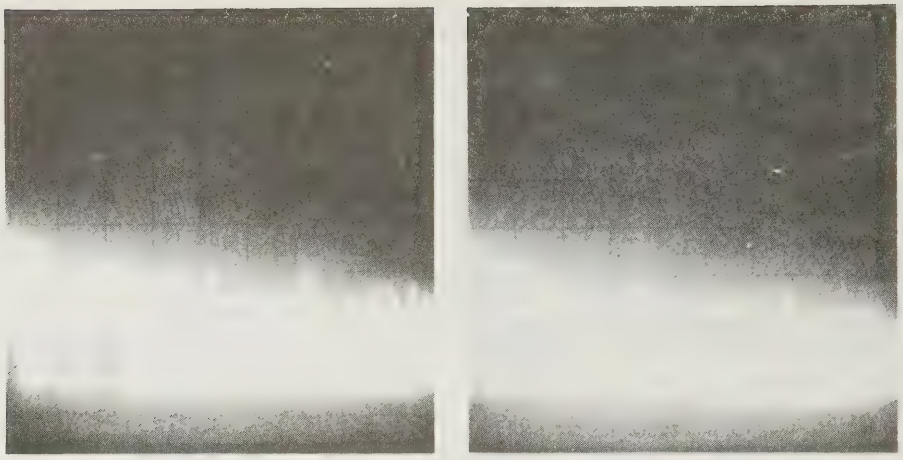
Initial tests made last fall indicated that the Paragon had very poor phase-noise characteristics. After ARRL lab engineers discussed the test results with Ten-Tec engineers, Ten-Tec provided a modified PLL board with improved filtering on the 723 voltage-regulator IC. Additional testing showed that the modified board greatly improved overall phase-noise performance, but close-in noise was much worse. Another modification resulted in much-improved phase-noise performance—both close in and far away from the carrier. These modifications are incorporated in current production boards. If you have an early Paragon, contact Ten-Tec about updating your PLL board.

Manual

The 22-page manual we originally received with the Product Review Paragon last fall contained all of the information needed to put the transceiver on the air, but it was skimpy. In February, Ten-Tec sent a copy of the final manual—what a difference! The new manual is more than 130 pages long. In addition to complete operating information, it features complete technical information usually found in service manuals that are available at extra charge. If you want to know how a modern transceiver works, you'll love the Paragon manual. More than 100 pages are devoted to circuit descriptions, schematics, PC-board layouts and parts-placement diagrams for *each PC-board subassembly in the radio*.

I especially liked the page of Condensed Operating Instructions, which shows initial control settings and tells you enough to get started. This page is sort of like the TV news version of how to operate the rig—short and to the point. It's a good idea because most hams don't like to read instructions anyway. After the initial thrill of using your new toy

[1]J. Grebenkemper, "Phase Noise and Its Effects on Amateur Communications," *QST*, Mar 1988, pp 14-20; and Apr 1988, pp 22-25. Feedback, May 1988 *QST*, p 44.



(A) (B)

Fig 4—Spectral display of the Ten-Tec Paragon transmitter output during phase-noise testing. Power output is 100 W at 3.5 MHz (A) and 14 MHz (B). Each vertical division is 10 dB; each horizontal division is 2 kHz. The scale on the spectrum analyzer on which these photos were taken is calibrated so that the log reference level (the top horizontal line on the scale in the photos) represents −60 dBc/Hz and the baseline is −140 dBc/Hz. Phase-noise levels between −60 and −140 dBc/Hz may be read directly from the photographs. The carrier, which would be at the left edge of the photographs, is not shown. These photographs show phase noise at frequencies 2 to 20 kHz offset from the carrier.

has worn off, you can take time to go over the Detailed Operating Instructions section to find out the function and proper use of each front- and rear-panel control and jack.

Hookup

The Installation section of the manual gives a brief description of what you need to hook up the Paragon. It's pretty straightforward. For starters, you need a 13.8-V power supply capable of delivering about 20 A. Wiring information is given in case you don't use Ten-Tec's matching Model 960 power supply. The Installation section recommends a low-impedance dynamic or electret microphone (high-impedance mics—above 25 kΩ—won't work), although text accompanying the mic connector wiring diagram later in the manual says that the microphone circuit has been designed for high- or low-impedance mics with at least 5-mV output.

Before using the Paragon, you are encouraged to hook up a 9-V battery to back up the microprocessor and RAM when power is removed. The battery backup allows the Paragon to retain memory and frequency information, as well as clock/calendar time and date. Battery installation requires removing the top cover and plugging in a connector. Batteries not included...

According to the manual, the battery backup is not needed if you leave the Paragon connected to a 13.8-V dc source (even with the power switch turned off). This means leaving your power supply turned on all the time. The original manual indicates that an alkaline battery will provide about 150 hours (6.25 days) of backup if power is removed. (This 150-hour rating is very conservative. I unplug my radio equipment when I'm away from the shack, and my first 9-V alkaline cell lasted months.) The new manual includes information on a modification for using a 9-V NiCd battery for backup. According to the manual, you can keep the NiCd battery adequately charged if you use the Paragon at least 3-4 hours per week. This modification, which is factory installed in Paragons with serial numbers higher than 395, requires a soldering iron, a 2.2-kΩ, ¼-W resistor, and about 15 minutes of your time. It's well worth doing.

Operating Impressions

I enjoyed using the Paragon over a period of several months. In addition to casual CW and SSB operating and DXing, I used it in several SSB and CW contests—including the phone ARRL November Sweepstakes. I like the panel layout and the way most of the features work.

I initially had trouble getting on the "right frequency" during CW operation. The instructions on using the SPOT switch are confusing, and the peak S-meter reading does not correspond to zero beat. In fact, the manual suggests using the wide filter in conjunction with the SPOT switch; this is not acceptable on a crowded band. After some experimenting and after "working myself" on a second transceiver in the shack, I discovered how to get on frequency. Don't ask me to try to put it into words!

The receiver held up well except during peak phone-contest periods when there were many strong signals on the band. During those periods, I had difficulty finding open spaces on the band and had difficulty copying weaker signals. The problem seems to be receiver phase noise, rather than front-end overload. Use of the attenuator made a noticeable improvement in signal copy. The general-coverage receiver works fine. AM selectivity is good, thanks to the 6-kHz crystal filters.

All in all, Ten-Tec has a fine radio in the Paragon. It does some of the basics—like AGC and CW keying—very well. Most of the things I didn't like are subjective. The Paragon is certainly worth your consideration if you're in the market for a high-performance transceiver. It's also worth considering Ten-Tec's well-deserved reputation for excellent customer service.

Manufacturer: Ten-Tec, Highway 411 East, Sevierville, TN 37862, tel 615-453-7172. Price class: Paragon, $2245; Model 960 power supply, $230; Model 285 500-Hz CW filter, $70.

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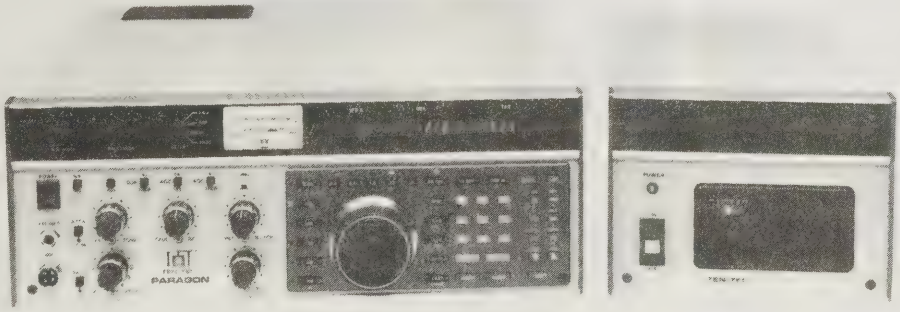

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rubber grip around its circumference. The feel is a bit light, though. More weight and more flywheel action would be a nice addition.

Receiver

The Paragon's receiver is a multiple-conversion design with IFs at 75, 9 and 6.3 MHz. (For FM, the third IF is 455 kHz.) Signals enter the receiver through switched low-pass filters (also used on transmit) and high-pass filters. The front-end RF amplifier consists of four paralleled JFETs (J310s) in a broadband circuit. (The RF amplifier is not used below 1.6 MHz.) The first receive mixer is a singly balanced design using two more J310s. There is some crystal filtering at each IF. The 75-MHz IF has a 2-pole crystal filter; the 9-MHz IF features a pair of 8-pole crystal filters with bandwidths of 6.0 kHz for AM operation and 2.4 kHz for SSB and CW operation. Passband tuning and additional crystal filtering occur at the 6.3-MHz IF. The 6.3-MHz crystal filters have bandwidths of 2.4 kHz, 1.8 kHz, 500 Hz and 250 Hz and are selected by front-panel switches. Only the 2.4-kHz third-IF filter is standard; the others are available as options.

During ARRL lab testing, the Paragon's receiver turned in some impressive numbers. Blocking dynamic range, at about 136 dB, is fantastic. In this receiver, the limiting factor when listening to very weak signals adjacent to very strong signals is receiver phase noise, not dynamic range. Phase noise is very audible at the onset of receiver blocking. (Blocking signal levels were in the 0 to +5 dBm range—much higher than you would expect to find at your antenna terminals under normal circumstances.) Sensitivity is more than adequate, and the two-tone, third-order IMD dynamic range is excellent as well.

Mode selection is accomplished with a series of momentary-contact pushbuttons arranged vertically to the left of the main tuning knob. Choices are CW, USB, LSB, AM and FM. FSK is selected by pressing the SHIFT and CW keys.

Receiver bandwidth selection is handled by a horizontal row of pushbuttons above the main tuning knob. Choices are 6.0, 2.4, 1.8, 0.5 and 0.25 kHz. (The last three work only if the optional third-IF filters are installed.) Filter selection is independent of mode (except for FM). This is a great feature. For example, if you operate AFSK RTTY using the LSB mode, you can switch in any of the narrow filters to eliminate adjacent-channel interference. Also, there are times when a narrow CW filter is a hindrance, rather than a help. It's nice having a couple of wider filters available.

The Paragon has several QRM-fighting controls. The most useful of these is passband tuning, which allows you to shift the passband response to effectively reduce interference from nearby signals. Less effective are the BP/FADE audio filter controls. Perhaps *subtle* best describes the effects of these two controls. Notch filter depth is about 40 dB; this control is helpful at times, although the notch is sharp and adjustment is critical.

The Paragon's variable-pulse-width noise blanker works great on Soviet over-the-horizon radar ("woodpecker") interference, although its use noticeably degrades the receiver's strong-signal-handling performance—an effect common with noise blankers. The noise blanker didn't do much for my power-line noise, though.

Pressing the front-panel attenuator switch substitutes a 10-dB pad for the front-end RF amplifier. The net effect is that signal levels

Table 1

Ten-Tec Model 585 Paragon 160-10 Meter Transceiver, Serial no. 084

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency coverage: Receiver, 100 kHz to 29.9999 MHz; transmitter, 160-10 meter ham bands.	As specified, except transmitter coverage extends ≈10 kHz above each amateur band.
Modes of operation: USB, LSB, CW, AM, RTTY (FSK or AFSK), FM (optional).	As specified.
Frequency display: 7-digit blue fluorescent.	
Frequency resolution: 10 Hz.	As specified.
Power requirement: 13.8 V dc at approx 1.5 A on receive and 20 A on transmit.	13.8 V dc at 17 A at 110 W output.
Transmitter	*Transmitter Dynamic Testing*
Transmitter output power: 25 to 100 W adjustable. 100% duty cycle for 20 min; continuous with auxiliary air cooling.	Typically 110 W max, 16 W min; power output varied slightly from band to band.
Spurious signal and harmonic suppression: Greater than 45 dB below peak power output.	See Fig 1.
Third-order intermodulation distortion products: Not specified.	See Fig 2.
CW keying waveform: Not specified.	See Fig 3.
Transmit-receive turnaround time (PTT release to 90% audio output with an S9 signal): Not specified.	35 ms.
Receiver	*Receiver Dynamic Testing*
Receiver sensitivity SSB, CW and RTTY: (2.4 kHz bandwidth) 0.5 μV for 10 dB S/N from 0.1-1.6 MHz; 0.15 μV for 10 dB S/N from 1.6-29.999 MHz.	Minimum discernible signal (noise floor), with 500-Hz filter: 1.0 MHz: −117.0 dBm 3.5 MHz: −139.5 dBm 14 MHz: −137.0 dBm
AM: (6.0 kHz bandwidth) 3.5 μV for 10 dB S/N from 0.1-1.6 MHz; 1.0 μV for 10 dB S/N from 1.6-29.999 MHz.	1.0 MHz: 4.2 μV 3.5 MHz: 0.27 μV 14 MHz: 0.34 μV (Test signal 30% modulated with a 1-kHz tone.)
FM: (15 kHz bandwidth) 1.0 μV for 12 dB SINAD from 0.1-1.6 MHz; 0.3 μV for 12 dB SINAD from 1.6-29.999 MHz.	Not tested; FM option not installed.
Receiver dynamic range: 100 dB typical; third-order intercept point +18 dBm.	Blocking dynamic range (dB)†: 3.5 MHz, 136.5 14 MHz, 136 Two-tone, third-order intermodulation distortion dynamic range (dB)†: 3.5 MHz, 101.5 14 MHz, 101.0 Third-order input intercept (dBm): 3.5 MHz, 12.75 14 MHz, 14.5
S-meter sensitivity (μV for S9 reading): 50.	88 at 1.9 MHz; 44 at 14 MHz; 70 at 28 MHz.
Squelch sensitivity: AM, CW, SSB, FSK (1.6-29.999 MHz), less than 1 μV. FM (1.6-29.999 MHz), less than 0.4 μV.	SSB/CW, 0.6 μV min; FM not tested
Notch filter: 50 dB notch typical.	Max notch 40 dB.
Receiver audio output: 1.5 W at 8 ohms with less than 2% total harmonic distortion (THD).	2.3 W at 2% THD
Color: Gray.	
Size (height, width, depth): 5.75 × 14.75 × 17 in.	
Weight: 16 lb (not including power supply)	

† Tone spacing was the ARRL Lab standard of 20 kHz for blocking dynamic range test and two-tone, third-order IMD dynamic range test.

are reduced about 20 dB. (The net reduction is 10 dB below 1.6 MHz because the RF amplifier is not used there.)

The front-panel PHONES jack is designed for 4- to 16-ohm headphones with a standard (monaural) ¼-inch jack. If you use stereo headphones, you'll need to rewire the plug or use an adapter.

A welcome surprise is the Paragon's excellent AGC. Its action is smooth, and there are no noticeable pops. (Anyone who has owned a Ten-Tec OMNI, as I have, will notice the improvement immediately.) Best of all, the AGC slope allows loud signals to sound louder than weak signals, and this makes it easier to pull call signs out of a pileup. AGC release times are about 0.2 second with the switch in the FAST position and 2 seconds in the SLOW position. The manual details a modification to increase the SLOW release time by 1 second, but I didn't make this modification. The original SLOW release time is just about right for casual operation.

Transmitter

The front-panel DRIVE control varies power output from about 15 W to 110 W, with slight variations from band to band. Ten-Tec rates the transmitter at 100% duty cycle for up to 20 minutes with no additional cooling. The review unit passed a 20-minute key-down test with flying colors. As Fig 1 shows, the transmitter low-pass filters do their job well. The spectral output of this unit is exceptionally clean on all bands. The two-tone IMD products (Fig 2) are acceptable. The CW keying waveform (Fig 3) is well shaped, and the on-air signal sounds good. Rise and fall times are about 4 ms. If you want harder or softer keying, the manual shows how to set the rise and fall times in the range of 1-5 ms.

The Paragon's full-break-in CW (QSK) feature gets an A+. It works well, even at speeds of 40 WPM and higher. With some radios, the transmitted characters are noticeably truncated in the full-break-in mode; you have to adjust your keyer weighting to get an acceptable-sounding signal at higher speeds. Not so with the Paragon. I spent a lot of time monitoring the Paragon's transmitted signal with a second receiver in my shack; the full-break-in signal sounded great at all the keying speeds I tried from 10 to 50 WPM. I made no adjustments to the keyer weighting control.

The CW offset is factory aligned at 750 Hz. Some operators prefer lower offsets, on the order of 300-400 Hz. According to Ten-Tec, you can retune the BFO for a lower offset; I did not try this. Rear-panel controls are provided for adjustment of sidetone pitch and level.

On SSB, I got a number of good audio reports, even with the speech processor on. The rear-panel MONITOR LEVEL permits listening to the Paragon's transmitted audio in your headphones. The monitor is useful for setting up the speech processor. I adjusted the speech processor while listening with a second receiver. The processor adds punch, but its adjustment range is narrow.

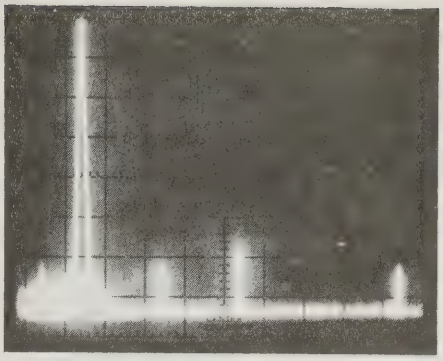


Fig 1—Worst-case spectral display of the Ten-Tec Paragon. Horizontal divisions are each 2 MHz; vertical divisions are each 10 dB. Output power is approximately 105 W at 3.5 MHz. All harmonics and spurious emissions are at least 56 dB below peak fundamental output. The Paragon complies with current FCC specifications for spectral purity.

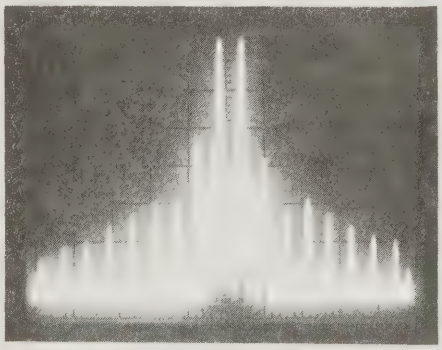


Fig 2—Spectral display of the Ten-Tec Paragon during two-tone intermodulation distortion (IMD) testing. Third-order products are approximately 33 dB below PEP output, and fifth-order products are approximately 49 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 2 kHz. The transceiver was being operated at 100 W PEP output on 3.8 MHz.

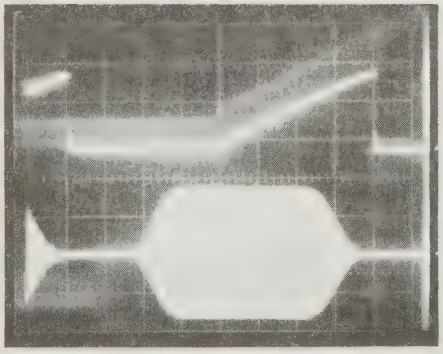


Fig 3—CW keying waveform for the Ten-Tec Paragon. The lower trace is the RF envelope; the upper trace is the actual key closure. Each horizontal division is 5 ms.

This is good; the signal is intelligible even with the processor and mic gain controls turned way up.

On SSB, you have the choice of PTT or VOX operation. The choice is just that—the microphone PTT switch has no effect when VOX is selected. I was disappointed that the VOX controls are on the Paragon's rear panel. I tend to adjust the VOX delay control quite often, and it's not convenient to get at.

Phase-Noise Measurements

With this review, we introduce transmitter phase-noise testing as part of the standard Product Review testing. March and April 1988 *QST* carry a two-part article describing phase noise, along with a complete discussion of ARRL laboratory phase-noise measurements.[1] The March/April article also shows results of ARRL lab testing of the phase-noise characteristics of other popular HF transceivers for comparison. Fig 4 shows two spectral photographs of the Paragon transmitter during phase-noise testing. This photograph was taken with the latest version (as of February 1988) of Ten-Tec's PLL board.

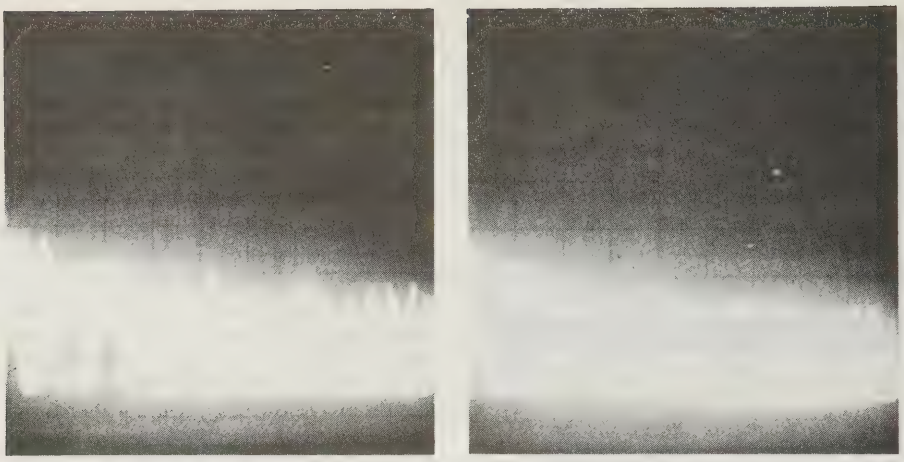
Initial tests made last fall indicated that the Paragon had very poor phase-noise characteristics. After ARRL lab engineers discussed the test results with Ten-Tec engineers, Ten-Tec provided a modified PLL board with improved filtering on the 723 voltage-regulator IC. Additional testing showed that the modified board greatly improved overall phase-noise performance, but close-in noise was much worse. Another modification resulted in much-improved phase-noise performance—both close in and far away from the carrier. These modifications are incorporated in current production boards. If you have an early Paragon, contact Ten-Tec about updating your PLL board.

Manual

The 22-page manual we originally received with the Product Review Paragon last fall contained all of the information needed to put the transceiver on the air, but it was skimpy. In February, Ten-Tec sent a copy of the final manual—what a difference! The new manual is more than 130 pages long. In addition to complete operating information, it features complete technical information usually found in service manuals that are available at extra charge. If you want to know how a modern transceiver works, you'll love the Paragon manual. More than 100 pages are devoted to circuit descriptions, schematics, PC-board layouts and parts-placement diagrams for *each PC-board subassembly in the radio*.

I especially liked the page of Condensed Operating Instructions, which shows initial control settings and tells you enough to get started. This page is sort of like the TV news version of how to operate the rig—short and to the point. It's a good idea because most hams don't like to read instructions anyway. After the initial thrill of using your new toy

[1]J. Grebenkemper, "Phase Noise and Its Effects on Amateur Communications," *QST*, Mar 1988, pp 14-20; and Apr 1988, pp 22-25. Feedback, May 1988 *QST*, p 44.



(A) (B)

Fig 4—Spectral display of the Ten-Tec Paragon transmitter output during phase-noise testing. Power output is 100 W at 3.5 MHz (A) and 14 MHz (B). Each vertical division is 10 dB; each horizontal division is 2 kHz. The scale on the spectrum analyzer on which these photos were taken is calibrated so that the log reference level (the top horizontal line on the scale in the photos) represents −60 dBc/Hz and the baseline is −140 dBc/Hz. Phase-noise levels between −60 and −140 dBc/Hz may be read directly from the photographs. The carrier, which would be at the left edge of the photographs, is not shown. These photographs show phase noise at frequencies 2 to 20 kHz offset from the carrier.

has worn off, you can take time to go over the Detailed Operating Instructions section to find out the function and proper use of each front- and rear-panel control and jack.

Hookup

The Installation section of the manual gives a brief description of what you need to hook up the Paragon. It's pretty straightforward. For starters, you need a 13.8-V power supply capable of delivering about 20 A. Wiring information is given in case you don't use Ten-Tec's matching Model 960 power supply. The Installation section recommends a low-impedance dynamic or electret microphone (high-impedance mics—above 25 kΩ—won't work), although text accompanying the mic connector wiring diagram later in the manual says that the microphone circuit has been designed for high- or low-impedance mics with at least 5-mV output.

Before using the Paragon, you are encouraged to hook up a 9-V battery to back up the microprocessor and RAM when power is removed. The battery backup allows the Paragon to retain memory and frequency information, as well as clock/calendar time and date. Battery installation requires removing the top cover and plugging in a connector. Batteries not included...

According to the manual, the battery backup is not needed if you leave the Paragon connected to a 13.8-V dc source (even with the power switch turned off). This means leaving your power supply turned on all the time. The original manual indicates that an alkaline battery will provide about 150 hours (6.25 days) of backup if power is removed. (This 150-hour rating is very conservative. I unplug my radio equipment when I'm away from the shack, and my first 9-V alkaline cell lasted months.) The new manual includes information on a modification for using a 9-V NiCd battery for backup. According to the manual, you can keep the NiCd battery adequately charged if you use the Paragon at least 3-4 hours per week. This modification, which is factory installed in Paragons with serial numbers higher than 395, requires a soldering iron, a 2.2-kΩ, ¼-W resistor, and about 15 minutes of your time. It's well worth doing.

Operating Impressions

I enjoyed using the Paragon over a period of several months. In addition to casual CW and SSB operating and DXing, I used it in several SSB and CW contests—including the phone ARRL November Sweepstakes. I like the panel layout and the way most of the features work.

I initially had trouble getting on the "right frequency" during CW operation. The instructions on using the SPOT switch are confusing, and the peak S-meter reading does not correspond to zero beat. In fact, the manual suggests using the wide filter in conjunction with the SPOT switch; this is not acceptable on a crowded band. After some experimenting and after "working myself" on a second transceiver in the shack, I discovered how to get on frequency. Don't ask me to try to put it into words!

The receiver held up well except during peak phone-contest periods when there were many strong signals on the band. During those periods, I had difficulty finding open spaces on the band and had difficulty copying weaker signals. The problem seems to be receiver phase noise, rather than front-end overload. Use of the attenuator made a noticeable improvement in signal copy. The general-coverage receiver works fine. AM selectivity is good, thanks to the 6-kHz crystal filters.

All in all, Ten-Tec has a fine radio in the Paragon. It does some of the basics—like AGC and CW keying—very well. Most of the things I didn't like are subjective. The Paragon is certainly worth your consideration if you're in the market for a high-performance transceiver. It's also worth considering Ten-Tec's well-deserved reputation for excellent customer service.

Manufacturer: Ten-Tec, Highway 411 East, Sevierville, TN 37862, tel 615-453-7172. Price class: Paragon, $2245; Model 960 power supply, $230; Model 285 500-Hz CW filter, $70.

MADE IN USA

TEN-TEC AMATEUR RADIO EQUIPMENT

America's Best!

The Paragon, Performance Plus ..., Model 585

PARAGON HF TRANSCEIVER, Model 585

All mode versatility and a transmitted signal you will be proud of. A receiver that has set new standards for sensitivity and quietness. Receives from 100 kHz to 29.999.99 MHz. Transmits on all bands from 1.8 MHz to 29.999.99 MHz with 100 watts output. SSB, CW, real FSK and optional FM. Standard equipment includes speech processor, noise blanker, dual VFOs, TX split, RX split and QSK with a changeover time of 30 ms or less. Five I-F filter positions with the 6 kHz AM filter and 2.4 kHz SSB filter, standard. Optional 1.8 kHz, 500 Hz and 250 Hz filters are selectable independent of mode. Two selectable tuning rates. Passband tuning, notch filter, audio bandpass filter, tone control, squelch and more!

Sixty-two programmable memories that store frequency, mode, filter selected, channel number and a 7 character alpha-numeric "tag" for entering channel I.D., tuner or amplifier settings, etc. Scan rate is selectable and as each memory is scanned all of the stored information is displayed (what a light show!). Alternately, the memories can be tuned with the main tuning knob.

Frequency selection is with the main tuning knob, direct keypad entry or up/down buttons that will shift in one kHz or one MHz increments or to the next ham band. DISPlay button selects 24 hour clock or date or tag. VOICE button causes a voice frequency announcement with optional synthesized voice board installed.

Rear panel controls are provided to adjust the VOX, CW monitor level and tone, and SSB sidetone monitor level. Switching is provided to control conventional linear amplifiers and of course, high speed switching for QSK linears, such as the Titan. Other rear panel inputs and outputs for transverters, FSK (170 Hz shift), fixed level audio out, audio in, external speaker, aux dc jack and provision for the optional RS-232 control interface. An absolute delight for the all mode operator.

The Paragon is the result of a three year engineering effort. We are proud of the Paragon and we think it has set new standards of excellence in synthesized rigs. Check it out yourself. We think that you will share our pride in the Paragon.

GENERAL SPECIFICATIONS

Frequency Range: Receive: 100 kHz to 29.9999 MHz. Transmit: 1.6 to 29.9999 MHz.
Frequency Control and Readout: Microprocessor controlled digital PLL synthesizer. 10 Hz resolution.
Frequency Stability: Worst case, 1 PPM per degree C. at 29.999 MHz.
Frequency Accuracy: ± 100 Hz @ 25 degrees C.
Antenna Impedance: 50 ohm unbalanced.
PC Boards: 14 double-sided, 9 single-sided .062" glass-epoxy.
Power Required: Receive = 1.5A. Transmit = 20A. 12 - 14 VDC.
Dimensions: HWD 5¾" x 10¾" x 17". 14.6 x 27.3 x 43.2 cm.
Net Weight: 16 lbs. 7.25 kg.

TRANSMITTER

Modes: USB & LSB (J3E), CW (A1A), FSK (F1A); FM (F3E) optional (Model 256).
DC Power Input: Maximum 200 watts.
RF Power Output: ALC stabilized, adjustable, 25 to 100 watts (into 50 ohms) with front panel RF OUT control.
Microrphone Input: Low impedance, bias voltage for electret provided.
CW Sidetone: Internally generated, adjustable tone and volume independent of AF GAIN control.
SSB Generation: 9 MHz, 8-pole crystal ladder filter. Balanced modulator.
Carrier Suppression: Greater than 60 dB.
Unwanted Sideband Suppression: Greater than 60 dB at 1.5 kHz AF input.
Harmonic Emissions: Greater than 45 dB below peak power output.
Spurious Output: Greater than 50 dB below peak power output.
Third Order Intermod Products: -30 dB from two-tone at 100 watts PEP.
Metering: Switchable forward power, SWR, collector current or audio processing level on SSB.
CW Offset: 750 Hz automatic.
FSK Shift: 170 Hz.
Transmit Offset Tuning Range: ± 99.9 kHz.

RECEIVER

Modes: USB, LSB, CW, FSK, AM, (FM optional).
Sensitivity:

	.1 - 1.6 MHz	1.6 - 29.999 MHz	
SSB/CW/RTTY	.5 uV	.15 uV	10 db S/N@ 2.4 kHz
AM	3.5 uV	1.0 uV	10 dB S/N @ 6.0 kHz
FM	1.0 uV	.3 uV	12 dB SINAD @ 15 kHz

Selectivity:

	-6 dB BW	-60 dB BW	Shape Factor
Standard AM	6.0 kHz	11.25 kHz	1.875:1
Standard SSB	2.4 kHz	3.36 kHz	1.87:1
Opt. 1.8 kHz SSB (Model 288)	1.8 kHz	2.9 kHz	1.60:1
Opt. 500 Hz CW (Model 285)	500 Hz	1.4 kHz	2.80:1
Opt. 250 Hz CW (Model 282)	250 Hz	.85 kHz	3.40:1
Standard FM	15 kHz	30 kHz	2.00:1

Attenuator: -20 dB for 1.6 to 29.999 MHz, -10 dB for .1 to 1.6 MHz.
I-F Frequencies: 1st = 75 MHz, 2nd = 9.0 MHz, 3rd = 6.3 MHz (FM 3rd = 455 kHz).
Image Rejection: Greater than 80 dB.
I-F Rejection: Greater than 70 dB.
Noise Blanker: Switchable on/off with adjustable width.
Dynamic Range: 100 dB.
Blocking Dynamic Range: + 16 dBm for 1 dB compression of an S9 signal, frequency offset = 50 kHz. -2 dBm for 1 dB compression of an S3 signal, frequency offset = 50 kHz.
Third Order Intercept: + 18 dBm.
Noise Floor: -132 dBm @ 2.4 kHz BW.
Squelch Sensitivity: Less than .6 uV.
Receiver Recovery Time: Less than 27 ms.
Receiver Offset Tuning Range: ± 99.9 kHz.
Pass Band Tuning I-F Shift: ± 1.2 kHz.
Audio Output: 1.5 watts @ 8 ohms.
Notch Filter: 250 to 2.2 kHz, greater than 50 dB notch depth.
Audio Bandpass Filter: 4 pole, variable center frequency 220 to 1.7 kHz, 35% bandwidth @ -6 dB.
Tone Control: Variable 15 dB rolloff @ 5 kHz.

Paragon Options

Model 256, FM Board.
This easily installed module adds FM transmit and receive capability. System bandwidth is 5 kHz.

Model 257, Voice Synthesizer Board.
This plug-in board announces the frequency displayed when the VOICE button is pressed.

Model 258, RS-232 Interface Board.
Provides remote computer control of frequency, mode, filter selection, VFO selection, all memory and scan features including memory programming and the other functions controlled from the push-button panel on the face of the Paragon. Supplied with command data for writing the program. Program discs are available from Ten-Tec for some of the more popular computers.

Model 259, Universal ALC Annunciator.
This is great for the vision impaired operators and can be installed in any transceiver with ALC. When the mic gain is advanced to the proper level, a beep sounds.

Classic Corsair II, HF Transceiver, Model 561

The CORSAIR II is unique in all the world. This is the only full featured ham transceiver manufactured today that uses a crystal mixed, permeability tuned oscillator. We continue to offer you this choice for a very good reason, superior receiver performance. Strong adjacent signals are effectively rejected and the extremely low noise floor does not vary when strong adjacent signals are present. The ability of a PTO controlled receiver to dig out weak signals that are surrounded by "heavy hitters" is hard to beat.

Frequency tuning versatility is also unique. The main knob tunes at 18 kHz per revolution, without "incrementing." Two slower tuning rates are provided by the dual range offset control. The offset tuning is selectable to control the receiver or the transmitter, or in "transceive."

The pass band tuning in combination with 16 pole crystal ladder filtering provides enviable selectivity. Our 50 + dB notch filter virtually eliminates carrier type interference. An eight pole audio bandpass filter is also standard. Numerous features are included to delight the all-mode operator. The I-F filters are selectable independent of mode. QSK with a changeover time of 30 ms or less is great on CW and AMTOR. An electronic CW keyer with a 40 character memory is built in. A "spot" button makes it easy to "zero" a CW signal. Selectable AGC—fast, slow or off. SSB performance is enhanced with an excellent speech processor that is standard equipment as is a noise blanker with adjustable level and width controls.

All nine ham bands, from 1.8 to 30 MHz, are covered using a 12 position band switch. Each position provides 500 kHz plus 40 kHz overshoot at the band edges. Most of the MARS frequencies are included. WWV is received at 10 MHz.

The solid state, broadband "no tune" 200 watt input final amplifier (pioneered by Ten-Tec) is a solid performer too. It will load a broader range of impedances and it does not "fold back" in key-down modes. De-rated components and excellent heat dissipation allow transmitter operation at full power, without auxiliary cooling, including the "key-down" modes with normal amateur duty cycles. The ALC control allows continuous adjustment of the output power level from 25% to 100%, independent of input drive levels. This is a great feature when using a low-drive amplifier, such as the Titan.

If your number one priority is outstanding all mode performance on the ham bands, and simplicity is still a virtue, you may be the kind of a purist that deserves a CORSAIR II.

GENERAL SPECIFICATIONS

Frequency Coverage: 160, 75/80, 40, 30, 20, 17, 15, 12 and 10 meters in twelve 500 kHz segments plus 40 kHz overshoot at upper and lower band edges.
Front Panel Multimeter: Reads power amplifier collector current, forward power, SWR, speech processing level and RX S-meter.
Front Panel Connections and Controls: BP FILTER; PBT; NOTCH; AF GAIN; POWER; RF GAIN/ATTN; DRIVE; bandswitch; main tuning knob; MODE; METER switch; KEYER SPEED; N.B. LEVEL/N.B. WIDTH; ALC threshold; PROCESS level; QSK/VOX select; AGC switch; XTAL switch; OFFSET SELECT switches (2); SPOT push-button; PHONES; MIC.
Rear Panel Connections and Controls: High speed QSK output jack (open collector); EXT T/R jack (relay closure); SPARE jack (uncommitted RCA phono); AUX 12 Vdc jacks (2); KEYER MEM. jack for controlling keyer memory; standard CW KEY jack; PTT jack; VFO IN/VFO OUT; AUDIO OUT; ACCESSORIES socket; GND terminal; EXT. SPKR jack; KEYER PADDLE jack; POWER socket; SO-239 ANTENNA connector; RX-TRX switch for separate RX antenna; RX antenna RCA jack; DELAY, GAIN, ANTI-VOX controls.
Power Required: 12-14 Vdc, 850 mA receive, 18.5 A transmit.
Dimensions: HWD 5.25" x 15" x 14" (13 x 38 x 36 cm) with bail retracted.
Net Weight: 14 lbs (6.4 Kg).
Frequency Display: 6 digit (to 100 Hz) amber LED.
Frequency Stability: Less than 15 Hz change per F degree averaged over a 40 degree change from 70 to 110 degrees F after 30 minute warm up. Less than 10 Hz change from 105 Vac to 125 Vac using a Ten-Tec power supply.

TRANSMITTER SPECIFICATIONS

Power Output: Broadband, solid state "no tune" amplifier with 85 to 100 watts RF out on all bands. Full power TX for up to 20 minutes without auxiliary cooling.
Output Impedance: 50 Ohm, unbalanced.
Iambic Keyer: Front panel speed adjustable from 8 to 50 wpm. Includes a 40 character memory, controlled from the KR1B accessory keyer.
Speech Processor: Audio type, processing level front panel adjustable.
CW Sidetone: Internally generated with adjustable tone and volume.
Full Break-In QSK: TX/RX changeover time of 30 mS or less.
ALC Control: Front panel adjustment sets RF output from 25% to 100%. Operates independently of input mic level, speech processing and CW drive. Output remains constant until you change it.
Microphone: Low or high impedance, 5 mV output. Polarizing voltage for electrets available at mic connector.
SSB Generation: 9 MHz, 8 pole crystal ladder filter, balanced modulator. Carrier and unwanted sideband suppression, 60 dB typical.
CW Offset: 750 Hz, automatic.
Spurious Emission: Down 45 dB or better at full output.

RECEIVER SPECIFICATIONS

Sensitivity: 0.25 uV for 10 dB S/N ratio.
Selectivity: 16 pole crystal ladder filtering, 2.4 kHz bandwidth, 1.6:1 shape factor at 6/60 dB. Three position front panel switch selects standard 2.4 kHz, optional 1.8 kHz, 500 Hz or 250 Hz filters. All four may be installed with 2.4, 1.8 kHz and 500 Hz accessible in SSB mode and 1.8 kHz, 500 and 250 Hz accessible in CW mode.
Noise Floor: –129 dBm at 2.4 kHz bandwidth.
Intercept Point: + 5 dBm.
Dynamic Range: 95 dB at 200 Hz bandwidth.
Notch Filter: Greater than 50 dB notch adjustable from 200 Hz to 3.5 kHz.
Audio Bandpass Filter: 8 pole active filter centered at 750 Hz variable from "filtered" to "flat" response.
Passband Tuning (PBT): Tunes 2nd I-F frequency 3 kHz.
Noise Blanker: Switchable on/off with adjustable level and width.
Offset Tuning: Dual range, selectable to offset RX, TX or TRX.
Antenna RX Pre-Amp: Selectable on/off, 20 dB gain.
Spot Button: To accurately "zero" a CW signal.
AGC: Selectable fast, slow and off.
I-F Frequencies: 9 and 6.3 MHz.
I-F Rejection: Greater than 60 dB.

The New OMNI V America's Best Just Got Better!

The OMNI V, Model 562, is a kissin' cousin to both the CORSAIR II and the PARAGON. The crystal mixed oscillator of the CORSAIR II has been married to the digital technology and phase locked loop frequency tuning system in the PARAGON. The result is phase noise performance that is superior to any other synthesized rig around.

Many of the nifty features made possible by digital technology are included. Dual VFO's with A-B-split select, frequency stability of a PLL, 25 tune/scan memories, VFO to MEM and MEM to VFO and RS-232 interface option. The memories are nonvolatile RAM and are retained until you change them. The status registers and clock are backed with a lithium battery (2 year life) so that when the rig is powered up, the status is the same as when you turned it off.

The OMNI V operates USB, LSB, QSK CW and real FSK. FM is optional. All bands from 160 through 10 meters are push button selectable. Each band position covers 500 kHz plus 24 kHz over-shoot at the low end and 32 kHz at the top. Tuning is in your choice of 10 Hz or 50 Hz increments on SSB, CW and FSK. With the FM option, tuning is in 100 Hz or 500 Hz increments. Up/Down buttons tune in 10 kHz or 50 kHz increments.

A noise blanker and audio speech processor are standard equipment. The rear panel has a full compliment of inputs, outputs and controls for the convenience of the all-mode operator. High speed key lines are provided for QSK control of a fast switching amplifier, such as the TITAN. Changeover in QSK is less than 30 ms, great for CW and the digital modes.

The front panel is spacious and friendly. The vacuum fluorescent display uses large, easy to read elements. The frequency display doubles as the 24 hour clock display when the CLOCK button is pressed. Other elements indicate VFO status and warn when the memories are full.

All four of the 6.3 MHz I-F filter positions are push-button selectable, independent of mode. A second filter socket is provided in the 9 MHz I-F for an optional 1.8 kHz, 500 Hz or 250 Hz filter which is selected with the NARROW button. This doubles the number of poles in the crystal filter network and even further reduces the impact of adjacent strong signals.

If you can survive without a general coverage receiver in your HF transceiver, the elegant OMNI V is a great choice. If you are also a serious DX-er and/or contester, the OMNI V is the only choice.

Specifications subject to change without notice.

GENERAL SPECIFICATIONS

Frequency Range: Transmit and receive on all ham bands from 160 through 10 meters in their entirety. Twelve 500 kHz segments plus 24 kHz over-shoot at the low end and 32 kHz at the high end.
Frequency Control: Digital phase locked loop with crystal mixed oscillator.
Frequency Stability: Worst case, 1 PPM per degree C at 29.999 MHz.
Frequency Accuracy: ± 100 Hz at 25 degrees C.
Antenna Impedance: 50 Ohms, unbalanced.
Printed Circuit Boards: G-10 epoxy.
Power Required: Receive = 1.5 A. Transmit = 20 A. 12-14 Vdc.
Dimensions: HWD 5¾" x 14¾" x 17". 14.6 x 27.3 x 43.2 cm.
Net Weight: 16 lbs. 7.25 Kg.

TRANSMITTER

Modes: USB and LSB (J3E), CW (A1A), FSK (F1A). Optional FM (F3E).
DC Power Input: 200 Watts maximum.
RF Power Output: ALC stabilized, adjustable from 20 watts to 100 watts (50 Ohm load) with front panel RF OUT control.
Microphone Impedance: 200 Ohms to 50k Ohms. Bias voltage for electret mic is provided in front panel connector.
CW Sidetone: Internally generated with rear panel level and tone adjustments, independent of front panel audio level control.
SSB Generation: 9 MHz, 8 pole crystal ladder filter, balanced modulator.
Carrier Suppression: Greater than 60 dB.
Unwanted Sideband Suppression: Greater than 60 dB at 1.5 kHz AF input.
Harmonic Emissions: Greater than 45 dB below peak power output.
Third Order Intermod Products: -30 dB from two tone at 100 watts PEP.
Metering: Switchable forward power, SWR, collector current or audio processing level on SSB.
CW Offset: 750 Hz.
FSK Shift: 170 Hz.

RECEIVER

Modes: LSB, USB, CW and FSK. FM with optional board.
Sensitivity: .15 uV for 10 dB signal to noise ratio at 2.4 kHz typical. With FM option, .3 uV for 12 dB SINAD at 15 kHz.
Selectivity: (see chart for Paragon)
Attenuator: -20 dB.
I-F Frequencies: 1st I-F 9 MHz, passband tuning I-F 6.3 MHz.
Image Rejection: ►60 dB.
I-F Rejection: ►60 dB.
Noise Blanker: Switchable on/off with width adjustment.
Dynamic Range: 97 dB useable.
Third Order Intercept: + 12 dBm.
Noise Floor: -133 dBm at 2.4 kHz bandwidth.
Squelch Sensitivity: Less than .6 uV.
Receiver Recovery Time: Less than 30 ms.
Pass Band Tuning I-F Shift: ± 1.2 kHz.
Audio Output: 1.5 watts at 8 Ohms.
Notch Filter: 250 Hz to 2.2 kHz, greater than 50 dB notch depth.
Audio Bandpass Filter: 4 pole, variable center frequency 220 Hz to 1.7 kHz, 35% band width at -6 dB.
Tone Control: Variable 15 dB roll-off at 5 kHz.

DO YOU KNOW...

Ten-Tec is in several businesses. We produce tools and dies for our own use as well as many other manufacturers. We fabricate a complete line of metal and molded plastic equipment enclosures as used on our products and those of other equipment manufacturers from coast to coast. We design and build special application electronics for government and industry around the world. If your business can benefit from this extraordinary in-house capability, we would be pleased to talk to you.

HF Accessories

KW Antenna Tuner, Model 229B

This tuner adds a lot of versatility to your station. For example, it solves the problem of operating an 80 meter dipole on 75 meters and still presenting your transmitter with an acceptable load impedance. Or if you want to explore the WARC bands and you haven't gotten around to installing resonant antennas for those bands, no problem. The 229B will load virtually any unbalanced load (coaxial or single wire) and do so at all the power the law allows from 1.8 through 30 MHz. The modified "L" network will tame an SWR of at least 10:1, any phase angle, without "false load" problems.

With the accessory balun, (installs easily inside the 229B cabinet) the same capability is available using balanced feedline antennas. Front panel switching selects any one of four antennas, one of which may use a balanced feedline, or you can by-pass the tuner. The meter circuit measures forward power in 2 ranges, 0-200 or 0-2 KW, and reflected power. A great way to operate all bands with something less than a "world class" antenna farm.

SPECIFICATIONS

Circuit: Modified "L" network.
RF Power: 2 KW.
Frequency Range: 1.8 to 30 MHz.
Output Matching Range: At least 10:1 SWR, any phase angle, 1.8 to 30 MHz. Maximum impedance at full power, 3000 ohms. Maximum impedance, balanced load using accessory balun, 500 ohms.
Input Impedance: 50 ohms, SO-239 connector.
Capacitor Voltage Rating: 3.5 kV.
Inductance: 28 uH silver plated roller inductor.
Size: HWD 5.5" x 13" x 11" (13.9 x 33 x 27.9 cm).
Weight: 9 lbs. (4.1 kg).

REMOTE VFO, Model 263

This little beauty adds a whole lot of versatility to the CORSAIR II system. It uses the same type PTO as the CORSAIR II and can control transmit, receive or transceive frequency. You can also listen to both transmit and receive frequencies simultaneously! A balance control is provided for "priority" adjustment. A great feature in a DX pile-up. A momentary "reverse" button is provided to check your transmit frequency in any PTO configuration. Four crystal sockets are built-in and are front panel selectable, a nice touch if you are a net operator. Crystal controlled operation is possible on any of these bands:

160M	1.7 to 2.1 MHz
80M	3.4 to 4.2 MHz
40M	6.9 to 7.4 MHz
30M	10.01 to 10.6 MHz
20M	13.8 to 14.6 MHz
17M	18.05 to 18.6 MHz
15M	20.8 to 21.65 MHz
12M	24.5 to 21.65 MHz
10M	27.8 to 30.0 MHz

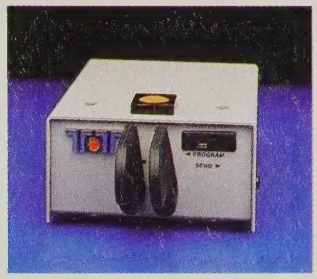
The 263 connects directly to the CORSAIR II using the prefabricated cables provided.

Size: HWD 5.25" x 7.5" x 12". (13.3 x 19 x 30.5 cm).
Weight: 4 lbs. (1.8 Kg).

SPEAKER/POWER SUPPLY, Model 961

Designed for use with any Ten-Tec 100 watt rig. This highly regulated and very well filtered power supply uses 105 to 125 or 210 to 250 Vac 50/60 Hz, primary power, fuse protected. The output voltage is adjustable from 11.5 to 15 Vdc, factory adjusted to 13.8 Vdc and "over-voltage" protection is incorporated. Regulation is better than 3%, from "no load" to "full load." A re-setting, electronic latching circuit breaker limits current for the protection of the power amplifier and is adjustable. Maximum load is 22 A. Ripple is less than 20 mV peak-to-peak at 20 A. The front panel mounted speaker is a ceramic magnet dynamic, 8 Ohm. The dc output cable is terminated into a 4 pin AMP MATE-N-LOC® which connects to any Ten-Tec transceiver. Two rear panel phono jacks may be used to supply dc to low power accessories.

Size: HWD 5.25" x 7.5" x 13.5" (13.3 x 19 x 34.3 cm).
Weight: 18 lbs. (8.2 Kg).

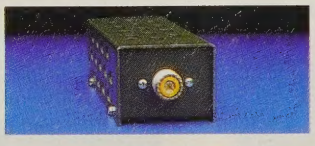


MICROPHONES FOR 525 (D), 546, 580

700A Hand mic, electret w/coiled cord and phone plug
705A Desk mic, electret with cord and phone plug

CIRCUIT BREAKER

1140 DC Models 546/560/561/562/580/585



BROADBAND DUMMY LOAD Model 239

160 through 2 meters with 1:1 SWR. Through 70 cm below 2:1 SWR. 300 watts intermittent duty.

DUAL PADDLE MEMORY KEY, CORSAIR II, Model KR1B/603

This lambic paddle is designed to operate the keyer system built into the CORSAIR II, including operation of the 40 character memory. Paddle "travel" is adjustable. Paddle "tension" is adjustable using a magnetic system controlled with a single rotary knob. Keyer is powered from an auxiliary dc jack on the rear panel of the CORSAIR II.

Model 604

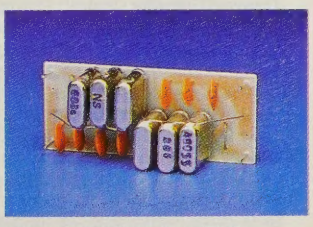
Iambic Electronic Keyer. Torque drive dual paddles, developed by Ten-Tec, pivot on low friction ball bearings and have fully adjustable magnetic tensioning to custom fit the 604 to your touch. Paddle travel is adjusted through access holes in the cabinet. Paddle contacts are silver with gold plated keyer contacts. Front panel adjustment of speed AND WEIGHTING. Full time dit and dah memories. Character speed range, 10 to 50 wpm. The top mounted button is a manual key-down control. A versatile keyer for any positive, low voltage circuit. Operates on 12 to 14 Vdc.

Model 605

Single Paddle Electronic Keyer. All of the electronic features of the Model 604. A traditional single paddle with spring tensioning is used. The 605 is ideal for mobile cw operation.

MICROPHONES FOR 560, 561, 562, 585

700 C Hand mic, electret w/coiled cord and connector
705 Desk mic, electret withcord and connector



HF ACCESSORY FILTERS

For 560, 561, 562, 580, 585 Transceivers
282 250 Hz 6 pole ladder filter
285 500 Hz 6 pole ladder filter
288 1.8 kHz 8 pole ladder filter

For 546/525 (D)
217 500 Hz 8 pole ladder filter
218 1.8 kHz 8 pole ladder filter
219 250 Hz 6 pole ladder filter
220 2.4 kHz 8 pole ladder filter

Titan, HF Linear Amplifier, Model 425

The Titan has it all! Maximum legal power with ease, all full power bands 160 through 15 meters (10 and 12 meters after authorized modification), lightning fast QSK for break-in cw and the digital modes and a two speed blower for quiet operation. This awesome performance from a desk top amplifier is made possible by the remote power supply and a pair of Eimac® 3CX800A7 ceramic triodes. The heart of the power supply is our own four core, tape wound Hypersil® transformer. This 41 lb behemoth is conservatively rated at 2.5 kVa CCS (9.2 kVa IVS) and is nearly noiseless, even at 1500 watts output!

Other features include a front panel, peak reading wattmeter using an instantaneous ten element LED bargraph display, PTT/VOX or QSK control line select switch, built-in SWR meter and an "over-drive" warning LED. 3:1 vernier TUNE and LOAD controls in combination with an outstanding RF deck design, make the Titan a real "pussy cat" to load and operate.

The Titan is styled to match our transceivers but it interfaces beautifully, no matter what exciter you are using. If you are ready to choose your dream amplifier, the Titan has it all! Check it out.

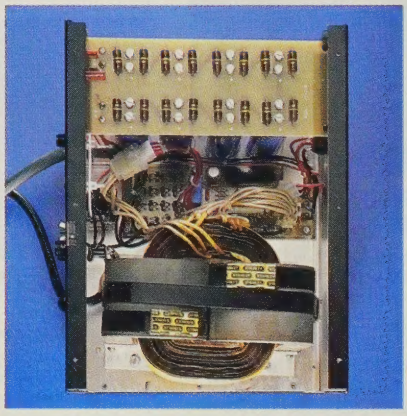
SPECIFICATIONS

Frequency Coverage: 1.8-2.0, 3.2-4.7, 6.5-8.5, 13.4-19.6, 17.6-23.0. With 10 meter modification, 17.6-26.5, 20.6-31 mHz.
Drive Power: 65 to 80 watts typical for 1500 watts output.
Efficiency: 50-65% depending on frequency, drive level and load.
Distortion: -35 dB from 1 KW RF output level.
Harmonics: -50 dB typical.
Input and Output Impedance: 50 ohms.
Transmit/Receive Control: Provision for PTT or QSK control lines, front panel selectable. T/R switching uses a Jennings® vacuum relay. RF sensing circuit prevents keying or un-keying if 10 mW of RF present on the RF drive line. Switching time less than 8 ms.
Tube Complement: Two Eimac® 3CX800A7 ceramic, external anode triodes in a grounded grid circuit. Total plate dissipation, 1600 watts.
Plate Voltage: 2400 Vdc, no load.
Over-Drive Protection: A front panel warning light turns on when grid current reaches the allowable limit. At the same time, the grid current limiting circuit takes over to protect the PA tubes.
Cooling: Ducted forced air, vertical exhaust, using a two speed centrifugal blower.
Metering: Full time plate current. Switch selected plate voltage, grid current, forward power or reflected power. Peak power is indicated on a 10 element LED bargraph display. The first nine elements are green—the tenth LED is red and indicates 1500 watts output.
ALC: Negative-going, adjustable threshold.
LED Status Indicators: Overdrive, Standby, Wait, Operate.
Primary Power: 220-250 Vac at 20 A, maximum. 117 Vac operation is possible but not recommended.
Protection: Primary line fuses, plate current fuse, ac line and high voltage interlocks.

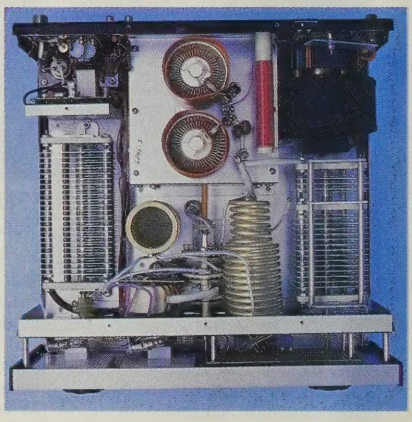
Front Panel Controls: Power ON-OFF, STANDBY-OPERATE, selectable control lines VOX/PTT or QSK. Plate TUNE and LOAD controls, BAND Switch, METER Switch.
Size: RF deck, HWD 5.25"x15.25"x15", (13.3 x 38.7 x 76.8 cm). Power supply, HWD 8.25" x 13.4" x 10.25", (21 x 34 x 60 cm).
Weight: RF deck, 17 lbs, (7.7 Kg). Power supply, 50 lbs, (20.5 Kg).

UPS shippable, factory packaged in three cartons; RF deck, power supply w/o power transformer, power transformer.

THE TITAN IS BACKED BY A 3-YEAR LIMITED WARRANTY



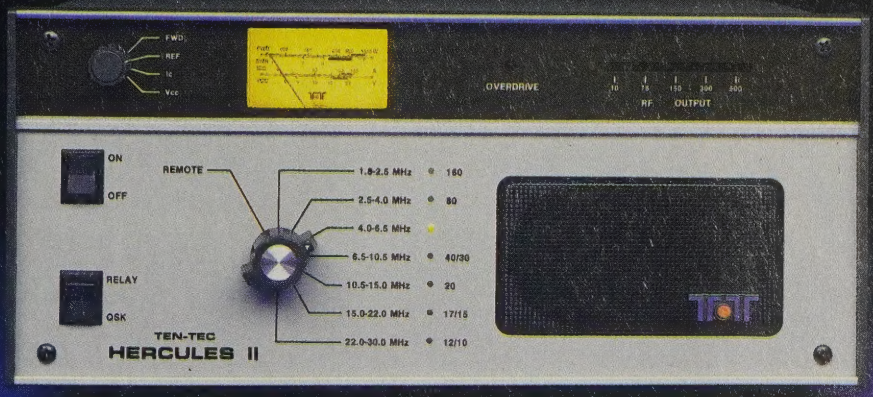
Power Supply



RF Deck

The ultimate in linear design and performance

Titan Paragon Station with 961 Power Supply



Hercules II No Tune HF Amplifier, Model 420

THE HERCULES II, SOLID STATE KW LINEAR AMPLIFIER

High-tech simplicity, base or mobile. Here is a compact, lightweight amplifier that offers a combination of unique features that can only be achieved using modern solid state technology. Instant on, 12-14 Vdc operation, no-tune broadband final and compact size. Add to that lightning fast QSK cw, remote control, superb linearity and a low drive requirement. Outstanding!

The HERCULES II is attractively styled to match the CORSAIR II, OMNI V or PARAGON and will interface nicely with virtually all transceivers. The front panel includes an analog multi-meter for collector current, voltage, forward power and SWR. A 10 element LED bar-graph display indicates peak output power. Band selection is made from the front panel switch or remotely controlled through a rear panel connector. A front panel speaker is built-in.

The Model 9420 115/220 Vac power supply is in a separate utility enclosure and connects to the RF deck using a 6 foot power cable. An additional 20 amps at 13.8 Vdc is provided to power a 100 watt exciter.

General coverage operation from 160 through 15 meters. (Through 10 meters after authorized modification.)

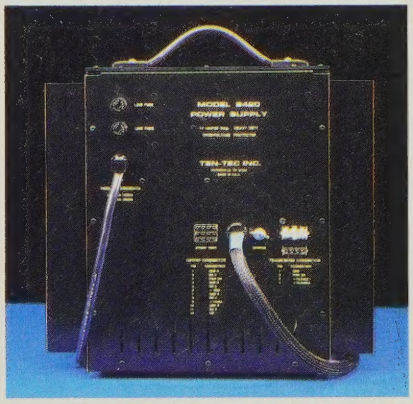
The HERCULES II is the ultimate in simplicity, ease of operation, versatility and reliability. And best of all, it is affordable! Another proud product from Ten-Tec.

SPECIFICATIONS

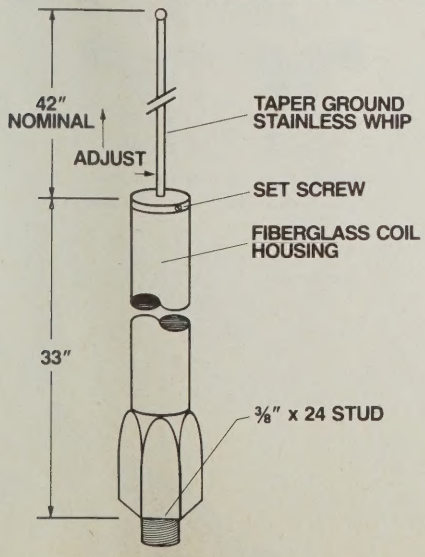
MODEL 420, RF DECK

Operating Frequency Range: General coverage 1.6 to 29.999.99 MHz. Coverage is in seven bands which are front panel or rear panel remote selectable.
RF Power: 1000 watts input, 500/600 watts output, depending on frequency and load impedance.
Drive Power: 65 to 80 watts typical for 500 watts output.
Distortion: -35 dB from 500 watt output level.
Harmonics: -50 dB typical.
Input and Output Impedance: 50 Ohms unbalanced, ◄ 2:1 SWR.
Cooling: Internal forced air, rear panel exhaust.
Metering: Switch selectable forward power, SWR, Icc (collector current) and Vcc (Voltage). Ten element LED bar graph displays peak output power.
Primary Power: RF deck, 12 to 14 volts at 100 amps, maximum.
TX/RX Switching Time: 10 ms or less.
Duty Cycle: 100% typical Amateur service. 10 minutes maximum continuous key-down at 500 watts output.
Final Amplifier Transistors: Eight MRF458, or equivalent.
ALC: Internal, 1.5 dB range.
Protective Circuits: Over-voltage and over-current lockout. Front panel "OVERDRIVE" light.
Front Panel Controls: Multi-meter control switch, power on-off switch and band select switch.
Rear Panel Connections: RF in, RF out, DC input, TX/RX control jacks and remote control socket.
Size: HWD 5.25" x 12" x 14.5".
Weight: 15 lbs.

MODEL 9420, AC POWER SUPPLY



Primary Power: Selectable 110/125 Vac at 14A or 220/250 Vac at 7A, 50/60 Hz.
DC Power Output: 13.5/14.5 Vdc at 4 x 25 amps. (20 amps for exciter).
Protection: Primary line fuses, over-voltage and over-current lockouts (from RF deck).
Size: HWD 12.5" x 12.5" x 9.25"
Weight: 58 lbs.



The Ultimate, HF Mobile Antenna System

HF mobile operation is a world of compromise. Give yourself a break and start with a good antenna system. The ULTIMATE series provides the best compromise between radiation efficiency and mechanical "reality!" The lower section is a fiberglass enclosed loading coil. The upper "stinger" is a top quality, stainless steel, taper ground whip. It is vertically adjustable for "no tears" tuning. The overall height allows use without a spring and clears most overhead obstacles. The overall profile provides the lowest wind resistance and as a result, less tilting and de-tuning. The entire assembly is environmentally protected for years of trouble free service. Use any mount with 3/8" x 24 fitting.

MODEL 3110, 10 Meter Antenna, 72"
MODEL 3115, 15 Meter Antenna, 72"
MODEL 3120, 20 Meter Antenna, 72"
MODEL 3130, 30 Meter Antenna, 72"
MODEL 3140, 40 Meter Antenna, 78"
MODEL 3175, 75 Meter Antenna, 78"
MODEL 3180, 80 Meter Antenna, 78"
MODEL 3101, Replacement Stinger 42"

MODEL 3001, 20 - 80 Mobile Matcher

Model 3001

Mode B, Satellite Station Model 2510B

Model 2410

Model 2425

SATELLITE STATION, MODE B, Model 2510B

The Model 2510B, mode B, satellite station is a 70 cm, 10 watt SSB and CW transmitter with a super-sensitive, low noise, 2 meter to 29 MHz receiver converter. The receive conversion idea takes advantage of the excellent selectivity and sensitivity that you already have in your HF station. Frequency tuning is with the PTO in the 2510B and the transmitter automatically tracks the receive frequency for "transceive" operation. "Split" operation is also provided. Two bands are included for full coverage of Oscar 10 and Oscar 13.

TRANSMITTER

Frequency Range: 435.0 to 435.895 MHz.
Output Power: Adjustable to 10 watts maximum.
Output Impedance: 50 ohms, unbalanced.
Modes: USB, LSB, CW. AFSK derived digital modes.
Sideband Generation: Balanced modulator through 4 pole monolithic filter.
Transmitter Switching: PTT through mic connector.
Carrier Suppression: 50 dB minimum.
Unwanted Sideband Suppression: 30 dB minimum at 1 kHz.
Spurious and Harmonic Output: Better than 50 dB below full power rating.
Microphone Input: Low or high impedance with 5 mV output. Polarizing voltage for electret mic available at connector.

RECEIVER

Frequency Range: 145.5 to 146.0 MHz. Converted to 29 MHz output.
Conversion Gain: 25 dB typical.
Image Rejection: Greater than 60 dB.
Noise Figure: Less than 2.5 dB. GaAsFet conversion.
Dynamic Range: 85 dB typical.

GENERAL

Power Requirement: 12 to 14 Vdc, 3 A maximum.
Size: HWD 4.5" x 7.6" x 11" (11.4 x 19 x 27.9 cm).
Weight: 6 lbs. (2.7 kg).

Linear Amplifier, 70 cm

LINEAR AMPLIFIER, 70 cm, ALL MODE, Model 2410

With type "N" connectors, Model 2410N

The 2410 is a 10 dB gain solid state, no-tune amplifier for operation from 430 to 450 MHz. 100 watts output with 10 watts drive. TX/STDBY switching can be controlled remotely with hard switching or will key automatically when 300 mW RF is sensed at the input circuit. The stripline design uses a high quality Teflon® circuit board and de-rated components throughout. Primary power is 12 to 14 Vdc at 20 A. Ideal for mobile, portable or base station use. A perfect companion for the 2510 Satellite station.

SPECIFICATIONS

Frequency Range: 430 to 450 MHz.
Output Power: 100 watts output with 10 watts drive.
Input Power: 15 watts maximum. RF sensing circuit keys amplifier at 300 mW.
Modes: SSB, CW, FM, RTTY.
DC Power: 12 to 14 Vdc at 20 A, typical.
Input/Output Impedance: 50 ohms, unbalanced.
Duty Cycle: 100%. typical amateur service.
Protection: Reverse voltage; over temperature kicks out at 170 degrees F, resets at 140 degrees F; internal 35 A fuse in dc line.
Delay: T/R delay adjustable in SSB mode.
RF Connectors: Model 2410, SO-239. Model 2410N, type "N".
Size: HWD 3.25" x 5.7" x 11.25" (8.3 x 15 x 29 cm).
Weight: 4 lbs., 14 oz. (2.2 kg).

2 Meter Amplifier, Model 2425

2 METER AMPLIFIER, 30 WATT, Model 2425

The model 2425 is a high quality, compact amplifier designed to be used with a hand-held transceiver. One to three watts of drive is amplified to thirty watts output. The amplifier is carrier operated and is ideally suited for mobile, portable or base station use.

SPECIFICATIONS

Frequency Range: 144 to 148 MHz.
Mode: Class C, FM or CW.
Input Power: 1 to 3 watts.
Output Power: 25 to 30 watts.
Harmonic Output: More than 60 dB below carrier.
Primary Power: 12 to 14 Vdc. 13.8 Vdc (negative ground) 5 A.
Impedance: 50 ohms input and output, unbalanced.
Switching: Carrier operated relay.
Size: HWD 2.25" x 4.12" x 5" (5.7 x 10.5 x 12.7 cm).
Weight: 1 lb. (.45 kg).

TEN-TEC WARRANTY AND PRODUCT SUPPORT

In 1968 Ten-Tec was founded by Albert Kahn, K4FW, and Jack Burchfield, K4JU. From the beginning, product support and customer service have been basic. Our philosophy is that a sale is the beginning of a friendship and that it is our obligation to provide fast and economical service if ever needed. The application of the principal of the "Golden Rule" and caring for our customers has contributed greatly to our success.

Our term of warranty is one year unless otherwise stated in the catalog listing. We promise you fast, thorough and caring service. If the unit is out of warranty, the service will be completed at a fair and honest cost. We strive to have all Ten-Tec owners happy ones.

...America's Best!

TEN-TEC

Highway 411 East
Sevierville, TN 37862, U.S.A.
(615) 453-7172
FAX: (615) 428-4483

MADE IN USA